



Pointer thermometer

MESSKO® MT-ST TRASY2

Operating instructions

5835912/01 EN



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The product may have been altered since this document was published.

We reserve the right to change the technical data, design and scope of supply.

Generally the information provided and agreements made when processing the individual quotations and orders are binding.

The original operating instructions were written in German.

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1 Introduction

This technical document contains detailed descriptions on the safe and proper installation, connection, commissioning and monitoring of the product.

This technical document is intended solely for specially trained and authorized personnel.

1.1 Manufacturer

Maschinenfabrik Reinhausen GmbH
Falkensteinstrasse 8
93059 Regensburg
Germany

Tel.: +49 941 4090-0

E-mail: sales@reinhausen.com

Internet: www.reinhausen.com

MR Reinhausen customer portal: <https://portal.reinhausen.com>

Further information on the product and copies of this technical file are available from this address if required.

1.2 Completeness

This technical file is incomplete without the supporting documents:

- Order confirmation

1.3 Safekeeping

Keep this technical file and all supporting documents ready at hand and accessible for future use at all times.

1.4 Notation conventions

This section contains an overview of the symbols and textual emphasis used.

1.4.1 Hazard communication system

Warnings in this technical file are displayed as follows.

1.4.1.1 Warning relating to section

Warnings relating to sections refer to entire chapters or sections, sub-sections or several paragraphs within this technical document. Warnings relating to sections have the following format:

WARNING



Type of danger!

Source of the danger and its consequences.

- ▶ Action
- ▶ Action

1.4.1.2 Embedded warning information

Embedded warnings refer to a particular part within a section. These warnings apply to smaller units of information than the warnings relating to sections. Embedded warnings use the following format:

 **DANGER!** Instruction for avoiding a dangerous situation.

1.4.1.3 Signal words and pictograms

Depending on the product, the following signal words and pictograms are used:

Signal word	Meaning
DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates measures to be taken to prevent damage to property.

Table 1: Signal words in warning notices

1 Introduction

Pictogram	Meaning
	Warning of a danger point
	Warning of dangerous electrical voltage
	Warning of combustible substances
	Warning of danger of tipping
	Warning of hot surface

Table 2: Pictograms used in warning notices

1.4.2 Information system

Information is designed to simplify and improve understanding of particular procedures. In this technical file it is laid out as follows:



Important information.

1.4.3 Instruction system

This technical file contains single-step and multi-step instructions.

Single-step instructions

Instructions which consist of only a single process step are structured as follows:

Aim of action

✓ Requirements (optional).

▶ Step 1 of 1.

⇒ Result of step (optional).

⇒ Result of action (optional).

Multi-step instructions

Instructions which consist of several process steps are structured as follows:

Aim of action

✓ Requirements (optional).

1. Step 1.

⇒ Result of step (optional).

2. Step 2.

⇒ Result of step (optional).

⇒ Result of action (optional).

1.4.4 Typographic conventions

The following typographic conventions are used in this technical file:

Typographic convention	Purpose	Example
UPPERCASE	Operating controls, switches	ON/OFF
[Brackets]	PC keyboard	[Ctrl] + [Alt]
Bold	Software operating controls	Press Continue button
...>...>...	Menu paths	Parameter > Control parameter
<i>Italics</i>	System messages, error messages, signals	<i>Function monitoring alarm triggered</i>
[▶ Number of pages].	Cross reference	[▶ 41].

Table 3: Typographic conventions

2 Security

This technical document contains detailed descriptions on the safe and proper installation, connection, commissioning and monitoring of the product.

- Read this technical file through carefully to familiarize yourself with the product.
- This technical file is a part of the product.
- Read and observe the safety instructions provided in this chapter in particular.
- Observe the warnings in this technical file in order to avoid function-related dangers.
- The product is manufactured on the basis of state-of-the-art technology. Nevertheless, risks to life and limb for the user or impairment of the product and other material assets may arise in the event of improper use.

2.1 Appropriate use

The pointer thermometer measures the temperature in transformers, shunt reactors and similar devices.

The product is designed solely for use in stationary large-scale systems.

If used as intended and in compliance with the requirements and conditions specified in this technical file as well as the warning notices in this technical file and attached to the product, then the product does not present any danger to people, property or the environment. This applies throughout the service life of the product, from delivery, installation and operation to removal and disposal.

The following is considered intended use:

- Only use the product with the transformer specified in the order.
- Operate the product in accordance with this technical file, the agreed-upon delivery conditions and the technical data.
- Ensure that all necessary work is performed by qualified personnel only.
- Use the equipment and special tools supplied solely for the intended purpose and in accordance with the specifications of this technical file.
- Operate the product in electrical energy systems and facilities.
- Only operate the product in industrial areas.
- Observe the notices in this technical document regarding electromagnetic compatibility and the technical data.

2.2 Fundamental Safety Instructions

To prevent accidents, disruptions and damage as well as unacceptable adverse effects on the environment, those responsible for transport, installation, operation, maintenance and disposal of the product or parts of the product must ensure the following:

Personal protective equipment

Loosely worn or unsuitable clothing increases the danger of becoming trapped or caught up in rotating parts and the danger of getting caught on protruding parts. This results in danger to life and limb.

- All necessary devices and personal protective equipment required for the specific task, such as a hard hat, safety footwear, etc. must be worn. Observe the "Personal protective equipment" [► Section 2.4, Page 14] section.
- Never wear damaged personal protective equipment.
- Never wear rings, necklaces or other jewelry.
- If you have long hair, wear a hairnet.

Work area

Untidy and poorly lit work areas can lead to accidents.

- Keep the work area clean and tidy.
- Make sure that the work area is well lit.
- Observe the applicable laws for accident prevention in the relevant country.

Contamination level

Moisture, dust, sweat and other conductive dirt may cause malfunctions in the device. To ensure contamination level II, observe the following information:

- Wear assembly gloves.
- Ensure that no dirt or moisture enters the device when it is open.
- Close up the device after installation.

2 Security

Explosion protection

Highly flammable or explosive gases, vapors and dusts can cause serious explosions and fire.

- Do not install or operate the product in areas where a risk of explosion is present.

Safety markings

Warning signs and safety information plates are safety markings on the product. They are an important aspect of the safety concept. Safety markings are depicted and described in the chapter "Product description".

- Observe all safety markings on the product.
- Make sure all safety markings on the product remain intact and legible.
- Replace safety markings that are damaged or missing.

Ambient conditions

To ensure reliable and safe operation, the product must only be operated under the ambient conditions specified in the technical data.

- Observe the specified operating conditions and requirements for the installation location.

Modifications and conversions

Unauthorized or inappropriate changes to the product may lead to personal injury, material damage and operational faults.

- Only modify the product after consultation with Maschinenfabrik Reinhausen GmbH.

Spare parts

Spare parts not approved by Maschinenfabrik Reinhausen GmbH may lead to physical injury, damage to the product and malfunctions.

- Only use spare parts that have been approved by Maschinenfabrik Reinhausen GmbH.
- Contact Maschinenfabrik Reinhausen GmbH.

Working during operation

You must only operate the product when it is in a sound operational condition. Otherwise it poses a danger to life and limb.

- Regularly check the operational reliability of safety equipment.
- Perform the inspection tasks described in this technical document regularly.

2.3 Personnel qualification

The person responsible for assembly, commissioning, operation and inspection must have the following qualifications.

Electrically skilled person

The electrically skilled person has a technical qualification and therefore has the required knowledge and experience, and is also conversant with the applicable standards and regulations. The electrically skilled person is also proficient in the following:

- Can identify potential dangers independently and is able to avoid them.
- Is able to perform work on electrical systems.
- Is specially trained for the working environment in which (s)he works.
- Must satisfy the requirements of the applicable statutory regulations for accident prevention.

Technical Service

We strongly recommend having repairs and retrofitting carried out by our Technical Service department. This ensures that all work is performed correctly. If repair work is not carried out by our Technical Service department, please ensure that the personnel who carry out the repairs are trained and authorized to do so by Maschinenfabrik Reinhausen GmbH.

Maschinenfabrik Reinhausen GmbH

Technical Service
P.O. Box 12 03 60
93025 Regensburg
Germany

Phone: +49 941 4090-0

E-mail: service@reinhausen.com
Internet: www.reinhausen.com

2 Security

2.4 Personal protective equipment

Personal protective equipment must be worn during work to minimize risks to health.

- Always wear the personal protective equipment required for the job at hand.
- Never wear damaged personal protective equipment.
- Observe information about personal protective equipment provided in the work area.

Protective clothing	Close-fitting work clothing with a low tearing strength, with tight sleeves and with no protruding parts. It mainly serves to protect the wearer against being caught by moving machine parts.
Safety shoes	To protect against falling heavy objects and slipping on slippery surfaces.
Safety glasses	To protect the eyes from flying parts and splashing liquids.
Visor	To protect the face from flying parts and splashing liquids or other dangerous substances.
Hard hat	To protect against falling and flying parts and materials.
Hearing protection	To protect against hearing damage.
Protective gloves	To protect against mechanical, thermal and electrical hazards.

Table 4: Personal protective equipment

This chapter contains an overview of the design and function of the product.

3.1 Scope of delivery

The product is packaged with protection against moisture and is delivered as follows:

- Pointer thermometer with temperature sensor
- Technical documents

Optional:

- M25x1.5 STD (brass), WADI (brass or stainless steel) or offshore (stainless steel) cable gland
- 1/2" 14NPT adapters
- 3/4" 14NPT adapters
- Vibration-damping plate or square bracket
- Step protection (only together with thermo well)

Please note the following:

- Check the shipment against the shipping documents for completeness
- Store the parts in a dry place until installation
- The product must remain in the packaging and may only be removed immediately before installation

3.2 Function description

Depending on the design, the pointer thermometer measures the oil temperature or winding temperature in power transformers, distribution transformers, arc suppression reactors or shunt reactors. The pointer thermometer

3 Product description

sensor is located in a thermo well, combi well or ZT-F2.1 temperature transmitter. These in turn are mounted in a thermometer pocket which is embedded in the transformer.

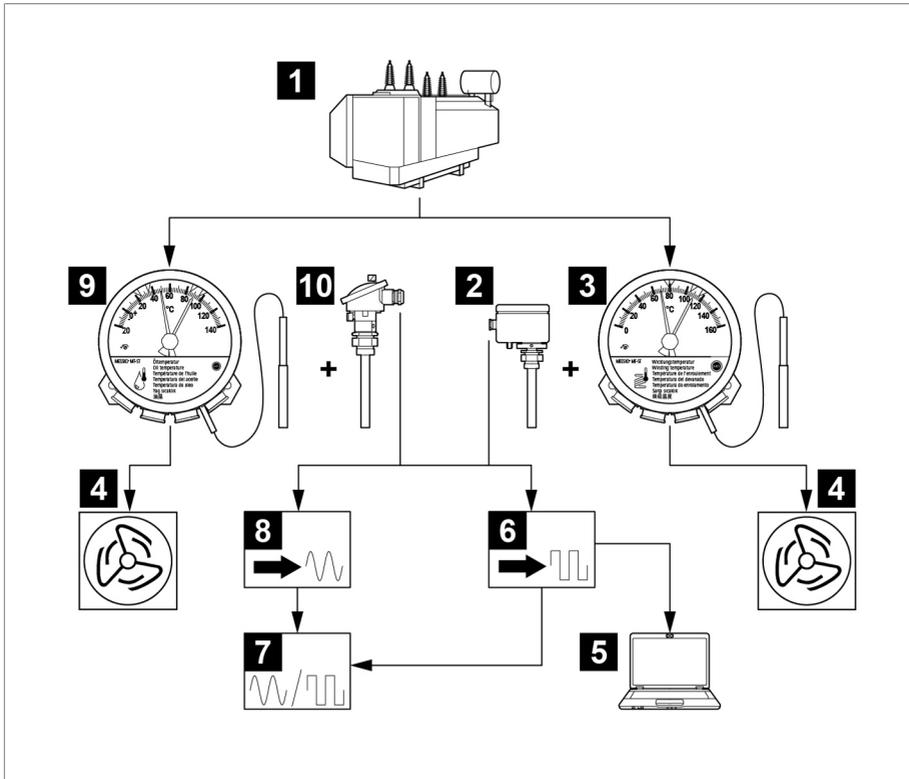


Figure 1: Example of temperature measurement and temperature display

1 Transformer	2 Temperature transmitter
3 Pointer thermometer for winding temperature	4 Transformer fan
5 SCADA	6 Digital signal converter
7 Digital display/analog display	8 Analog signal converter
9 Pointer thermometer for oil temperature	10 Combi well

3.3 Design

3.3.1 Design/versions

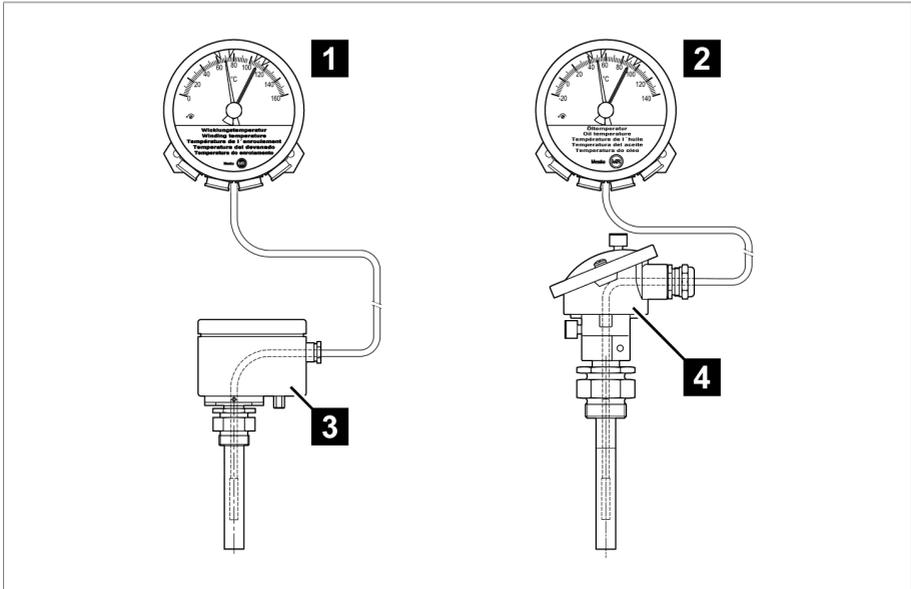


Figure 2: TRASY2 product versions

1 TRASY2 MT-STW160F2 – winding temperature

2 TRASY2 MT-ST160F – oil temperature

3 MESSKO® ZT-F2.1 transformer temperature transmitter (with Pt100 and/or 4...20 mA)

4 Combi well (with Pt100 and/or 4...20 mA)

3 Product description

3.3.2 TRASY2 overview

Depending on your order, the pointer thermometer features cable glands or NPT adapters.

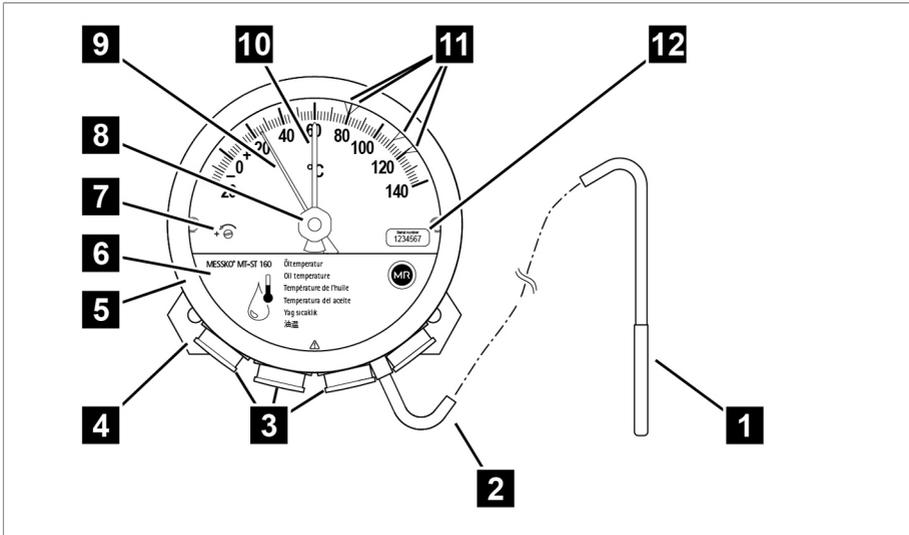


Figure 3: Pointer thermometer

1 Temperature sensor	2 Capillary line
3 Cable glands/adapters	4 Vibration-damping plate
5 Bayonet seal ring, glass pane and gasket	6 Cover plate
7 Calibration screw	8 Drag hand reset
9 Pointer	10 Drag hands
11 Adjustable micro-switches	12 Label with serial number



The pointer thermometer is calibrated at the factory. Do not adjust the calibration screw **7**, or else the device's warranty will be voided!

3.3.3 Cable glands/adapters

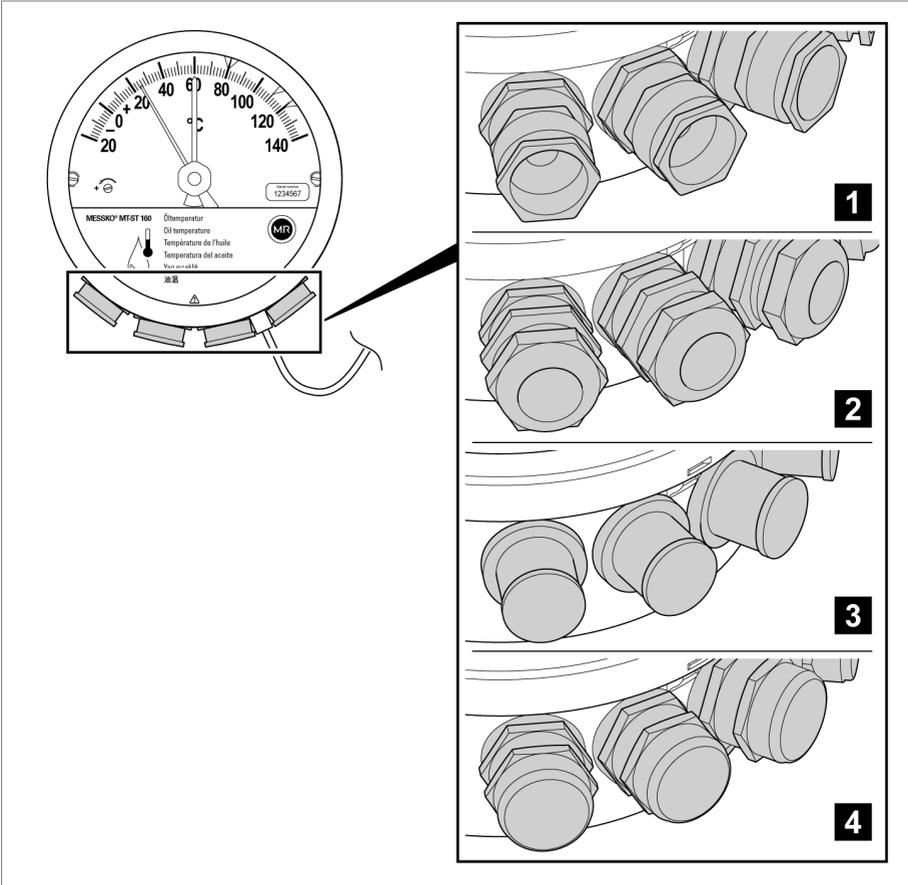


Figure 4: Cable glands

1 Standard cable gland

2 WADI cable gland

3 1/2" 14NPT adapter

4 3/4" 14NPT adapter

3 Product description

3.3.4 Ventilation

The pointer thermometer features ventilation to prevent the formation of condensate.

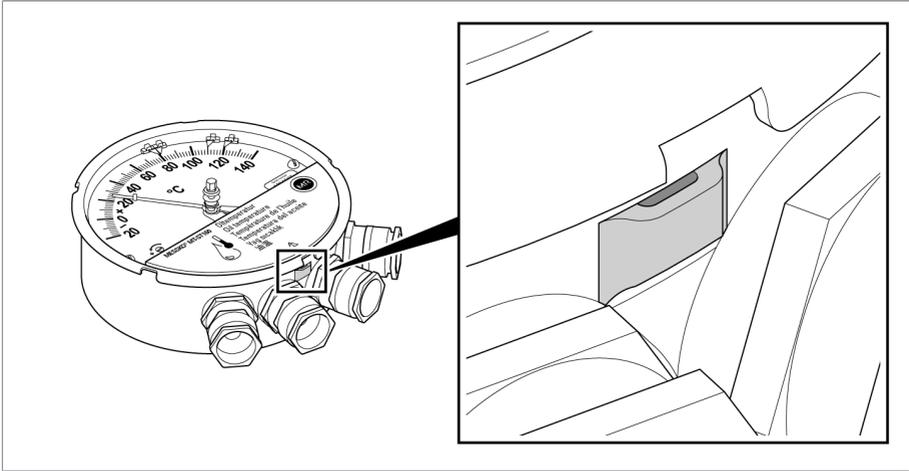


Figure 5: Ventilation

3.3.5 TRASY temperature sensor overview

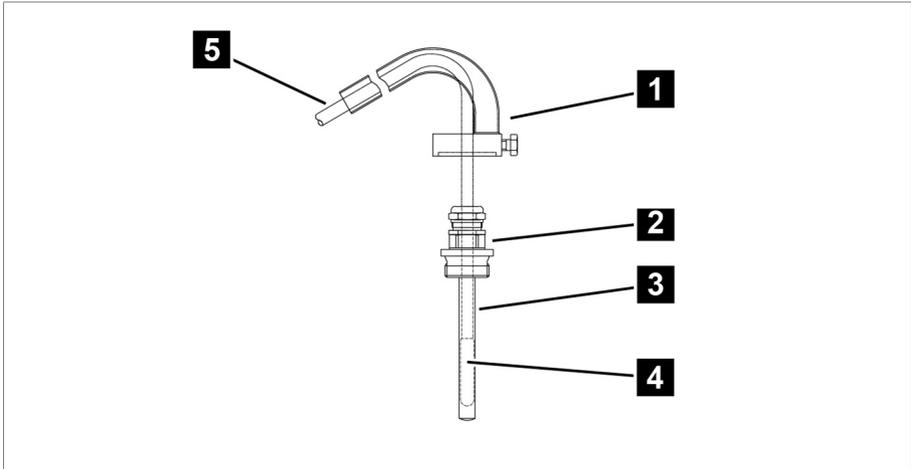


Figure 6: Temperature sensor in G1" thermo well

1 Step protection (optional)

2 G1" thermo well screw connection

3 G1" thermo well

4 Temperature sensor

5 Capillary line

3.4 Versions

Das Zeigerthermometer gibt es in folgenden Ausführungen:

MT-ST160F

- Anzeige der Öltemperatur.
- Zeigerthermometer mit verstellbaren Mikroschaltern.
- Die angezeigte Temperatur entspricht der Öltemperatur am Temperaturfühler des Zeigerthermometers.
- Das mechanische Messsystem funktioniert selbstständig und energieunabhängig.
- Abhängig von Ihrer Bestellung kann der Temperaturfühler in den Zusatzgeräten Einbauhülse und Kombihülse montiert werden. Weitere Informationen für das Zusatzgerät Kombihülse finden sie in der Betriebsanleitung der Kombihülse.

3 Product description

MT-STW160F2

- Anzeige der Wicklungstemperatur.
- Zeigerthermometer mit verstellbaren Mikroschaltern.
- Der Temperatursprung zwischen Isolierflüssigkeit und Wicklung hängt unter anderem vom Strom in der Wicklung ab.
- Der Wandlersekundärstrom ist dem Strom in der Wicklung des Transformators verhältnismäßig.
- Der Wandlersekundärstrom speist einen Heizwiderstand im Zusatzgerät ZT-F2.1, der dadurch eine der Transformatorbelastung entsprechende Anzeigerhöhung der tatsächlich gemessenen Öltemperatur (Sprungtemperatur) bewirkt. Weitere Informationen für das Zusatzgerät finden Sie in der Betriebsanleitung des Temperaturegebers ZT-F2.1.

3.5 Safety markings

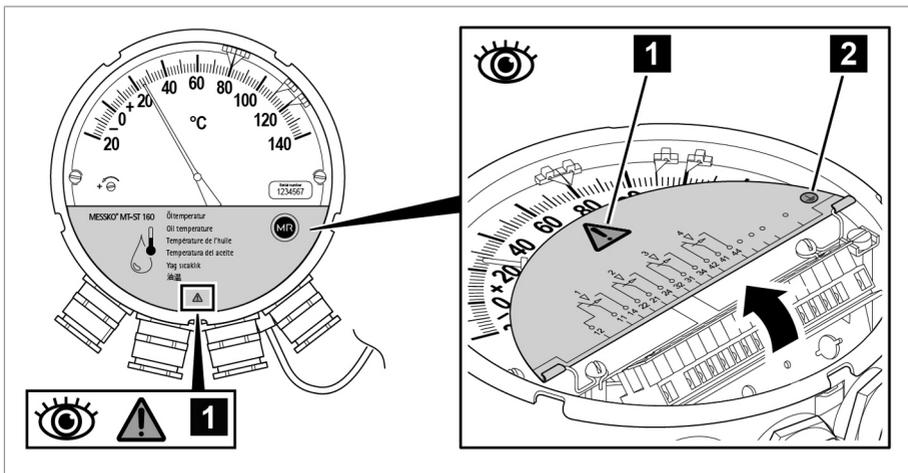


Figure 7: Safety markings

1 Observe the documentation

2 Protective conductor connection

3.6 Nameplate

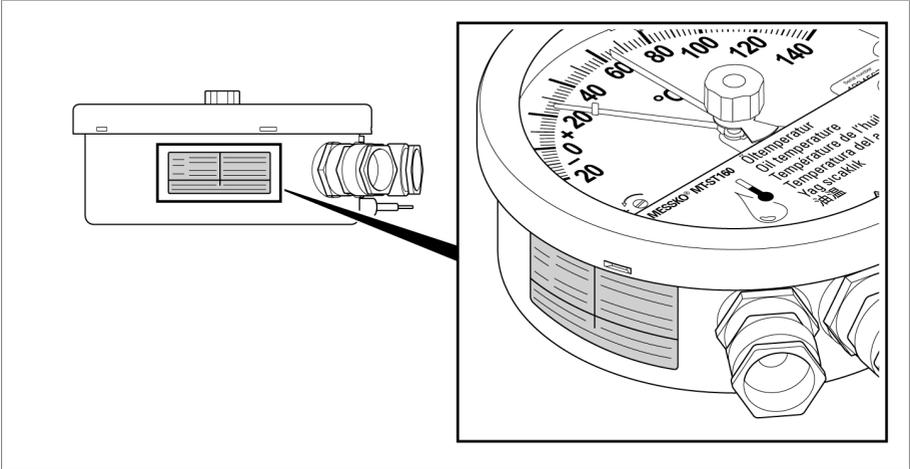


Figure 8: Nameplate

4 Packaging, transport and storage

4.1 Purpose

The packaging is designed to protect the packaged product during transport, loading, unloading and during periods of storage in such a way that no detrimental changes occur. The packaging must protect the goods against permitted transport stresses such as vibration, knocks and moisture (rain, snow, condensation).

The packaging also prevents the packaged goods from moving impermissibly within the packaging.

4.2 Suitability, structure and production

The goods are packaged in a sturdy cardboard box or solid wooden crate. These ensure that the shipment is secure when in the intended transportation position and that none of its parts touch the loading surface of the means of transport or touch the ground after unloading.

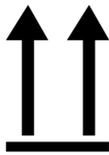
Inlays inside the box or crate stabilize the goods, preventing impermissible changes of position and protecting them from vibration.

4.3 Markings

The packaging bears a signature with instructions for safe transport and correct storage. The following symbols apply to the shipment of non-hazardous goods. Adherence to these symbols is mandatory.



Protect against moisture



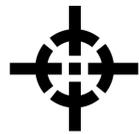
Top



Fragile



Attach lifting gear here



Center of mass

Table 5: Shipping pictograms

4.4 Transportation, receipt and handling of shipments

In addition to vibrations, jolts must also be expected during transportation. To prevent possible damage, avoid dropping, tipping, knocking over and colliding with the product.

If the packaging tips over or falls, damage is to be expected regardless of the weight.

4 Packaging, transport and storage

Every delivered shipment must be checked for the following by the recipient before acceptance (acknowledgment of receipt):

- Completeness based on the delivery slip
- External damage of any type.

The checks must take place after unloading when the cartons or transport container can be accessed from all sides.

Visible damage

If external transport damage is found upon receipt of the shipment, proceed as follows:

- Immediately record the transport damage found in the shipping documents and have this countersigned by the carrier.
- In the event of severe damage, total loss or high damage costs, immediately notify the sales department at Maschinenfabrik Reinhausen GmbH and the relevant insurance company.
- After identifying damage, do not modify the condition of the shipment further and retain the packaging material until an inspection decision has been made by the transport company or the insurance company.
- Record the details of the damage immediately on site together with the carrier involved. This is essential for any claim for damages.
- If possible, photograph damage to packaging and packaged goods. This also applies to signs of corrosion on the packaged goods due to moisture inside the packaging (rain, snow, condensation).
- Be absolutely sure to also check the sealed packaging.

Hidden damage

When damage is not determined until unpacking after receipt of the shipment (hidden damage), proceed as follows:

- Make the party responsible for the damage liable as soon as possible by telephone and in writing, and prepare a damage report.
- Observe the time periods applicable to such actions in the respective country. Inquire about these in good time.

With hidden damage, it is very hard to make the transportation company (or other responsible party) liable. Any insurance claims for such damage can only be successful if relevant provisions are expressly included in the insurance terms and conditions.

4 Packaging, transport and storage

4.5 Storage of shipments

When selecting and setting up the storage location, ensure the following:

- Store the product and accessories in the original packaging until installation.
- Protect stored goods against moisture (rain, flooding, water from melting snow and ice), dirt, pests such as rats, mice, termites etc. and against unauthorized access.
- Store crates and boxes on pallets, timber beams or planks as protection against ground moisture and for improved ventilation.
- Ensure that the foundation has sufficient load-bearing capacity.
- Keep entrance paths clear.
- Check the stored goods at regular intervals. Also take appropriate action after storms, heavy rain or snow etc.

4.6 Further transport

Use the original product packaging for further transport.

If you transport the product to the final installation site in a mounted state, observe the following information in order to protect the product against mechanical damage due to external influences.

Transport packaging requirements

- Select packaging suitable for the duration of transport or storage, taking the climatic conditions into consideration.
- Ensure that the packaging protects the product against transport stress such as shaking, vibrations and impacts.
- Ensure that the packaging protects the product against moisture such as rain, snow and condensation.
- Ensure that the packaging allows for sufficient air circulation in order to prevent the formation of condensation.

5 Installation and commissioning

This chapter describes how to mount and connect the device correctly. Observe the following hazard notices prior to opening the device:

⚠ DANGER



Electric shock!

Risk of fatal injury due to electrical voltage. Always observe the following safety regulations when working in or on electrical equipment.

- ▶ Disconnect the equipment.
- ▶ Lock the equipment to prevent an unintentional restart.
- ▶ Make sure all poles are de-energized.
- ▶ Ground and short-circuit.
- ▶ Cover or cordon off adjacent energized parts.

⚠ CAUTION



Risk of injury and damage to the device

The measurement system is hermetically sealed. If you cut the capillary line, harmful liquid can escape and the measurement system will be destroyed.

- ▶ Never cut the capillary line.
- ▶ Do not damage the capillary lines or sensors.

NOTICE

Damage to the device!

Electrostatic discharge can lead to damage to the device.

- ▶ Take precautionary measures to prevent the build-up of electrostatic charges on work surfaces and personnel.

5 Installation and commissioning

NOTICE

Damage to the device!

If you kink the capillary line or carry the device by the capillary line, the device can become damaged and display incorrect measured values as a result.

- ▶ Carefully remove the device from the packaging.
- ▶ Never carry the device by the capillary line.
- ▶ Do not damage the capillary line and sensor.
- ▶ Unroll the capillary line without bending or kinking it.
- ▶ Observe the minimum bending radius of 50 mm.

5.1 Transporting in the installed state

If transportation of the entire assembled unit is necessary between mounting the device onto the transformer / oil conservator and commissioning it, please also refer to the information on further transport [▶ Section 4.6, Page 26].

NOTICE

Damage to the device

The device can become damaged during transport due to unsuitable packaging.

- ▶ Use suitable packaging for transporting the device in the installed state.
- ▶ Protect the device against mechanical damage.
- ▶ Prevent the ingress of rain water.
- ▶ Ensure sufficient air ventilation without the formation of condensation.

5.2 Checking measured temperature values

Before attaching the pointer thermometer, you can check the accuracy of the display with a reference measurement. The pointer thermometer is calibrated at the factory.

- ✓ Only perform a reference measurement in moving liquid baths. Use of the MESSKO MZT1650S calibration bath offered by Maschinenfabrik Reinhausen GmbH is recommended.
- ✓ The temperature of the liquid bath must remain constant for 15 minutes.

5 Installation and commissioning

- ✓ Use an additional, calibrated glass thermometer to perform the reference measurement.
 - 1. Immerse the temperature sensor of the pointer thermometer and a calibrated glass thermometer in the liquid bath for approx. 15 minutes.
 - 2. Compare the measured temperature values of the pointer thermometer and glass thermometer with each other.
- ⇒ If the measured temperature values deviate from each other significantly (maximum permitted deviation ± 3 °C), contact the service department of Maschinenfabrik Reinhausen GmbH [► Section 2.3, Page 13].

5.3 Mounting the pointer thermometer

In the following sections, the installation of a pointer thermometer for oil temperature measurement with a thermo well is described. If you have ordered a pointer thermometer with an additional device, read the accompanying operating instructions:

Additional device	Device designation	Property
Temperature transmitter	MESSKO® ZT-F2.1	Pointer thermometer for winding temperature measurement.
Combi well (PT100 or 4...20 mA)	MESSKO® combi well	Pointer thermometer for oil temperature measurement.

Table 6: Additional devices

5 Installation and commissioning

5.3.1 Attaching the pointer thermometer to the transformer

When attaching the thermometer to the transformer, note the following information:

- Ensure that the pointer thermometer is mounted vertically.

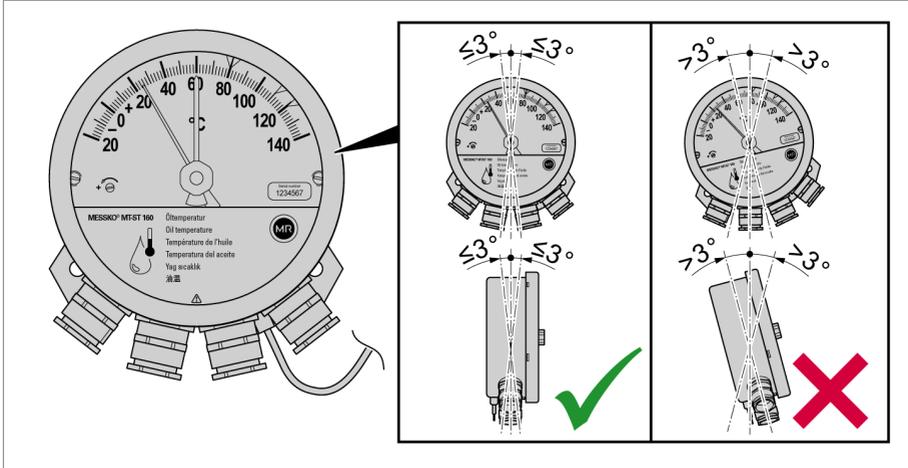


Figure 9: Mounting position

- Ensure that the pointer thermometer is not subjected to any vibrations at the installation location.
- Comply with EMC standards [► Section 5.4.1.1, Page 38].
- Observe the dimensions in the chapter Technical data.

5.3.1.1 Attaching the pointer thermometer using the vibration-damping plate

You can use the following screws to attach the pointer thermometer:

- M8 hexagon screws or cylinder screws.
- Use a screw length that is appropriate based on the installation situation.

5 Installation and commissioning

To attach the pointer thermometer to the transformer, proceed as follows:

1. Drill two holes, with a distance of 140 mm (5.51") and a diameter of 9 mm (0.35"), into a suitable bracket on the outside of the transformer, on the control cabinet mounting plate or on another suitable structure.

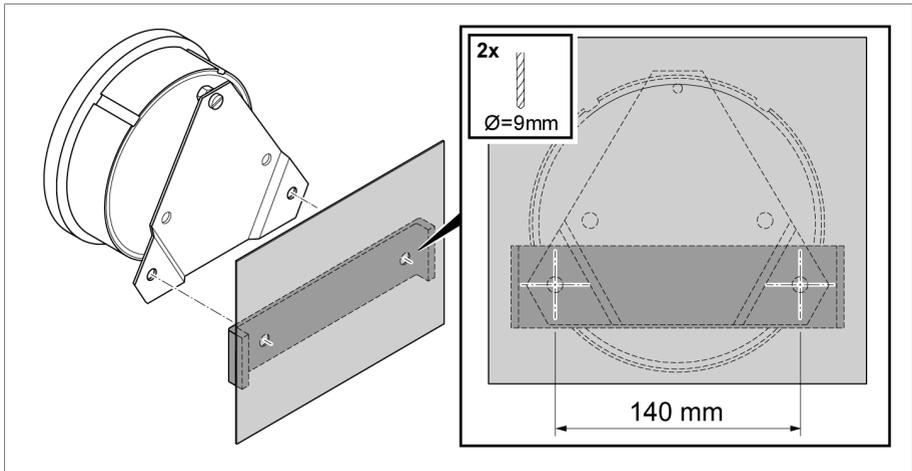


Figure 10: Holes

2. Attach the pointer thermometer with vibration-damping plate to the transformer.

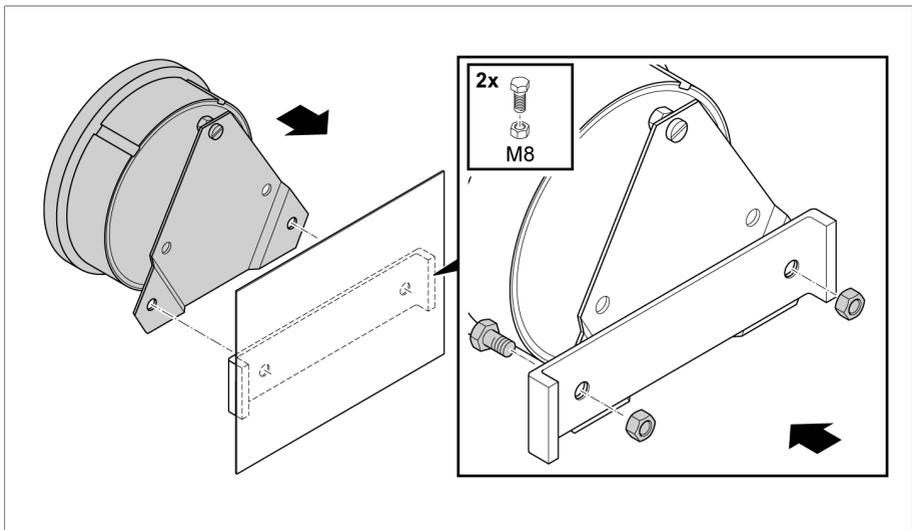


Figure 11: Attaching the pointer thermometer with vibration-damping plate

5 Installation and commissioning

5.3.1.2 Mounting the pointer thermometer using a square mounting plate

You can use the following screws to attach the pointer thermometer:

- M12 hexagon screws or cylinder screws (as an alternative, also 7/16-14 UNC).
- Use a screw length that is appropriate based on the installation situation.

To attach the pointer thermometer to the transformer, proceed as follows:

1. Drill two holes, with a distance of 184 mm (7.24") and a diameter of 12.5 mm (0.49"), into a suitable bracket on the outside of the transformer, on the control cabinet mounting plate or on another suitable structure.

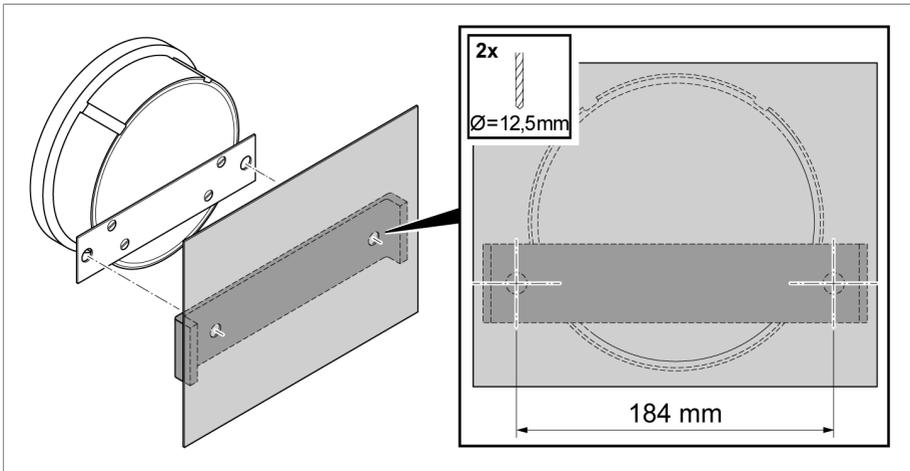


Figure 12: Holes

2. Attach the pointer thermometer with mounting plate to the transformer.

5 Installation and commissioning

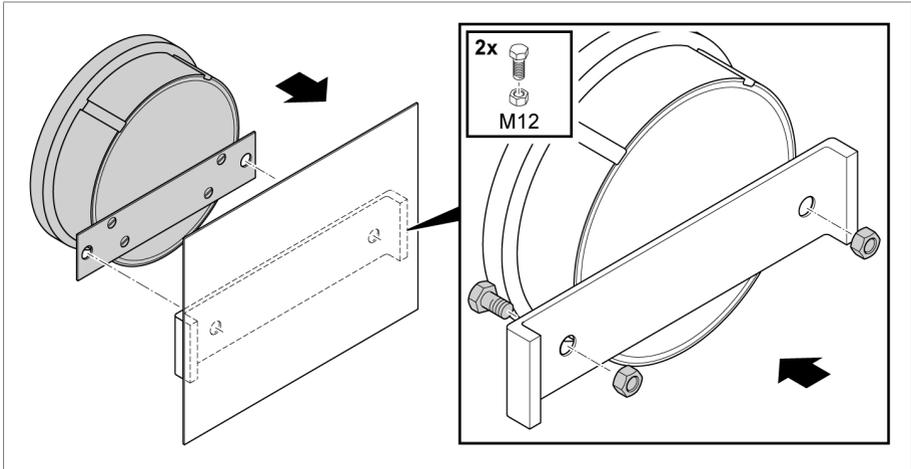


Figure 13: Attaching the pointer thermometer with mounting plate

5.3.2 Securing the capillary line

When securing the capillary line, note the following information:

NOTICE

Damage to the device!

A capillary line bending radius that is too narrow can lead to a loss of device function!

► Ensure compliance with the minimum bending radius of 50 mm (1.97").

- Attach the capillary line to the transformer so that it cannot be damaged during transport or operation, due to factors such as impact, scuffing, pressure, vibrations or crushing.

Proceed as follows:

1. Route the capillary line to the transformer and secure it with cable ties.
2. Wind up any excess capillary line with a minimum winding diameter of 80 mm (3.15").

5 Installation and commissioning

5.3.3 Inserting the thermo well and temperature sensor into the thermometer pocket

1. Fill 2/3 of the thermometer pocket of the transformer with oil or heat-conducting paste.

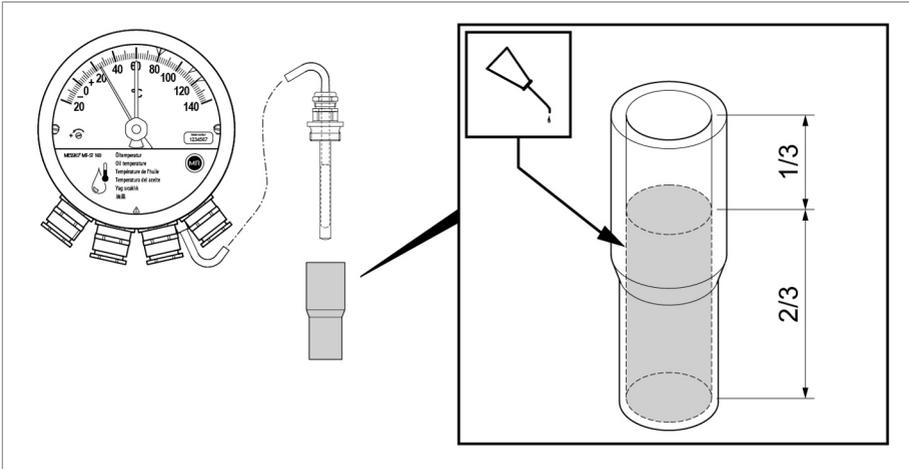


Figure 14: Filling the thermometer pocket

5 Installation and commissioning

2. Unscrew the provided thermo well (optional) and remove the dust protection disk.

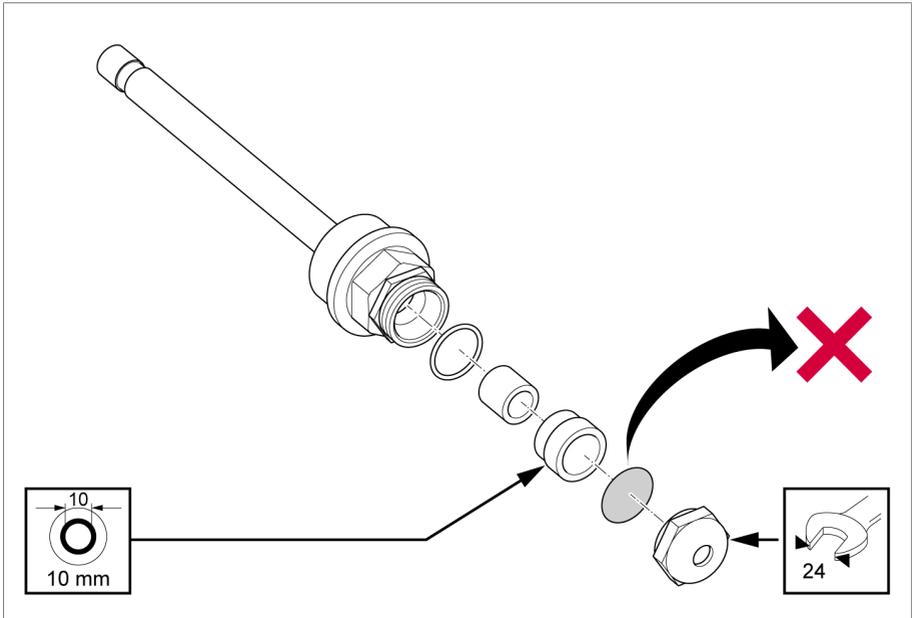


Figure 15: Removing the dust protection disk

3. Insert the thermo well into the thermometer pocket and screw it in.

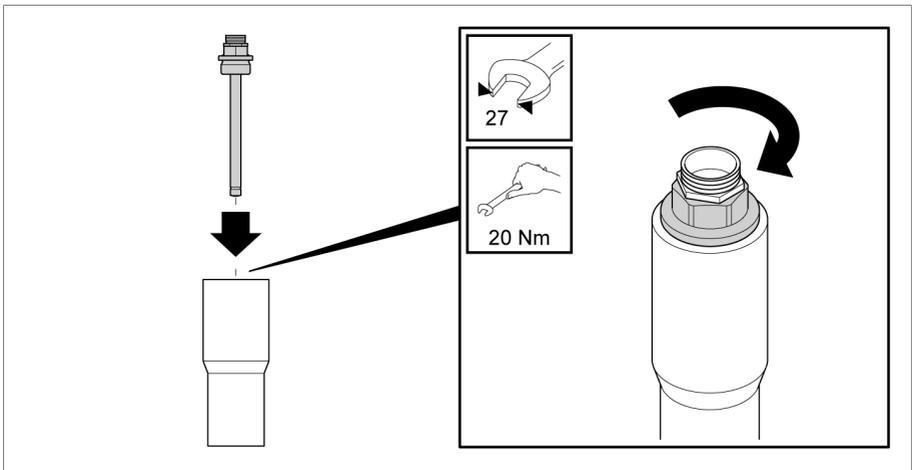


Figure 16: Inserting and screwing in the thermo well

4. Fill 2/3 of the thermo well with oil or heat-conducting paste.

5 Installation and commissioning

5. Guide the temperature sensor through the pressure screw, seal ring and pressure ring. Then, insert the temperature sensor 180 mm into the thermo well and tighten the pressure screw of the thermo well.

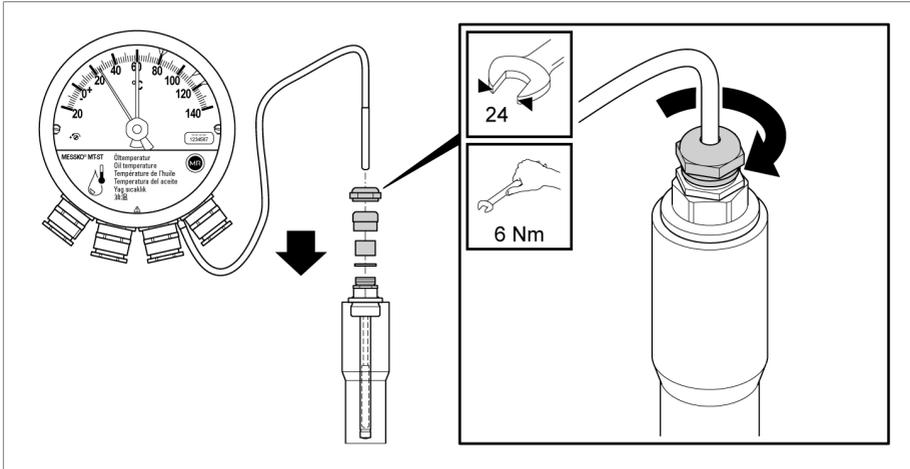


Figure 17: Inserting and screwing in the temperature sensor

5 Installation and commissioning

5.3.4 Attaching the step protection (optional)

You can equip the capillary line with step protection when using the G1" thermo well.

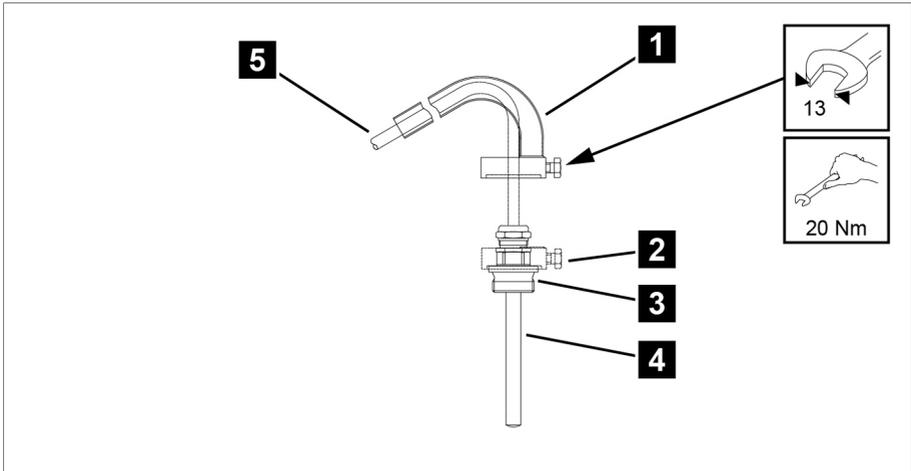


Figure 18: Step protection

- | | |
|--|-------------------|
| 1 Step protection | 2 Fixing screw |
| 3 Large G1" thermo well screw connection | 4 G1" thermo well |
| 5 Capillary line | |

1. Place the step protection **1** on the large screw connection **3** of the thermo well.
2. Route the capillary line **4** inside the step protection **1**.
3. Tighten the fixing screw **2** of the step protection to the wrench flat of the large screw connection **3**.

5 Installation and commissioning

5.4 Electrical connection

This chapter describes how to connect the device correctly. Observe the following hazard notices prior to opening the device:

⚠ DANGER



Electric shock!

Risk of fatal injury due to electrical voltage. Always observe the following safety regulations when working in or on electrical equipment.

- ▶ Disconnect the system.
- ▶ Lock the system to prevent an unintentional restart.
- ▶ Ensure all poles are de-energized.
- ▶ Ground and short-circuit.
- ▶ Cover or cordon off adjacent energized parts.

NOTICE

Damage to the device!

Electrostatic discharge can lead to damage to the device.

- ▶ Take precautionary measures to prevent the build-up of electrostatic charges on work surfaces and personnel.

5.4.1 Preparation

Observe the following information for the electrical connection.

5.4.1.1 Electromagnetic compatibility

The device has been developed in accordance with the applicable EMC standards. The following points must be noted in order to maintain the EMC standards.

5.4.1.2 Safeguarding the power circuits

You may only connect the device to circuits with an external overcurrent protective device and an all-pole isolating device so that the equipment can be fully de-energized if required.

5 Installation and commissioning

Suitable equipment includes isolating devices in accordance with IEC 60947-1 and IEC 60947-3 (e.g. circuit breakers). Note the properties of the relevant circuits (voltage, maximum currents) when selecting the circuit breaker type. In addition, observe the following:

- It must be easy for the operator to access the isolating device.
- The isolating device must be labeled for the device and circuits to be isolated.
- The isolating device may not be a part of the power line.
- The isolating device may not interrupt the main protective conductor.

Miniature circuit breaker

You must protect the mains circuits (supply voltage, main switching contacts) with a miniature circuit breaker. The miniature circuit breaker must have the following properties:

- Rated current: 6 A
- Triggering characteristic: C

Conductor cross-section

For all mains circuits, you must use a conductor cross-section that is appropriate for the miniature circuit breaker you have selected.

5.4.1.3 Cable recommendation

Please note the following recommendation from Maschinenfabrik Reinhausen GmbH when wiring the device:

- For the MT-ST160F and MT-ST160F2 device versions, the connection cables used must have a temperature resistance of at least +105 °C (ambient temperature max. +80 °C plus intrinsic device heating of +25 K).
- The cables used must be flame-resistant in accordance with IEC 60332-1-2 or UL 2556 VW-1.
- If both low voltage and extra-low voltage are connected in the device, it must be ensured that the circuits for extra-low voltage and for low voltage in the connection area and in the cable are separated from each other with double insulation.

5 Installation and commissioning

Cable ¹⁾	Terminals	Cross section
Micro-switches	12, 11, 14; 22, 21, 24; 32, 31, 34; 42, 41, 44	1.5...2.5 mm ² / 16...12 AWG
PE protective conductor connection		>= all other lines

Table 7: Recommendation for connection cable (standard connections)

It must be possible to apply a nominal voltage of at least 300 V to all connection cables;
Cable type unshielded rigid or flexible.

5.4.2 Removing the bayonet seal ring

Before connecting, setting or testing the pointer thermometer, the bayonet seal ring must be removed.

- ▶ Turn the bayonet seal ring counter-clockwise to the stop.

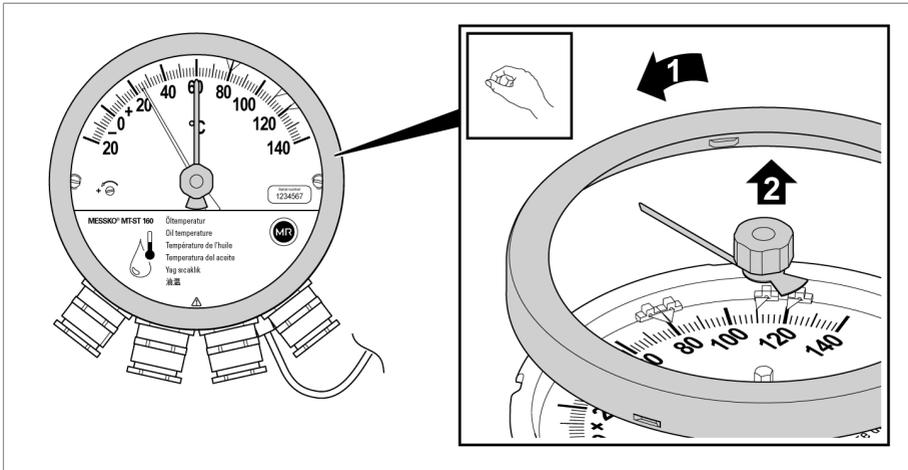


Figure 19: Removing the bayonet seal ring

- ▶ Lift off the bayonet seal ring along with the viewing glass and rubber gasket and place them safely on a clean, even storage surface.

5 Installation and commissioning

5.4.3 Opening the cover plate

The individual connection cables in the device are connected as shown in the diagram, which is printed on the inside of the cover plate.

- Open the cover plate.

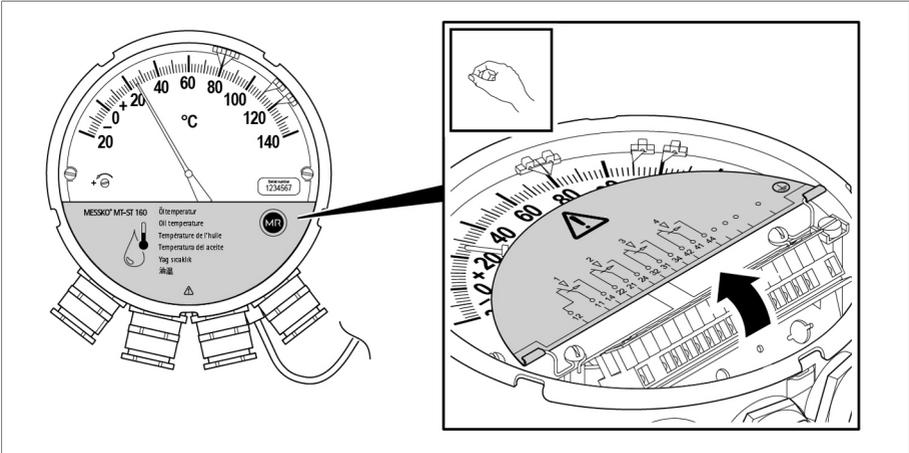


Figure 20: Opening the cover plate

5.4.4 Preparing the cables

To prepare the cables correctly, proceed as follows:

1. Note the cable recommendation.
2. Route the connection cable without tension and attach it so that neither the device nor the cable gland is subjected to mechanical stress.
3. Remove approx. 160 mm (6.3") of the jacket from the cable of the respective connection lines, strip approx. 6 mm (0.24") of the insulation from the wires and seal with ferrules.

5 Installation and commissioning

4. Ensure that the cable for the protective conductor is 50 mm longer and equip the conductor with a ferrule.

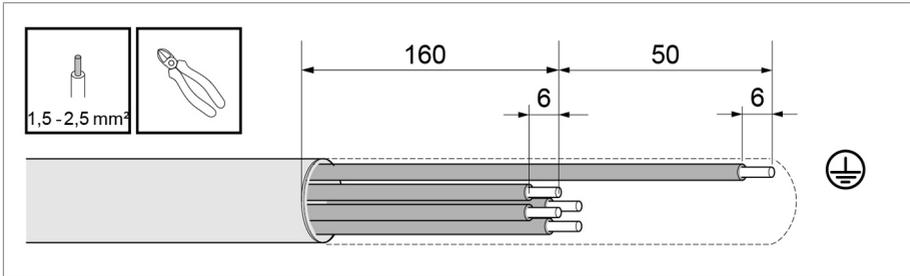


Figure 21: Stripping the cable jacket and wire insulation (example)

5.4.4.1 Standard cable gland

1. **NOTICE!** If the cable gland is not used, equip it with a sealing plug or replace the entire cable gland with a dummy plug in order to ensure the IP degree of protection.
2. Remove the locking screw on the adapter.

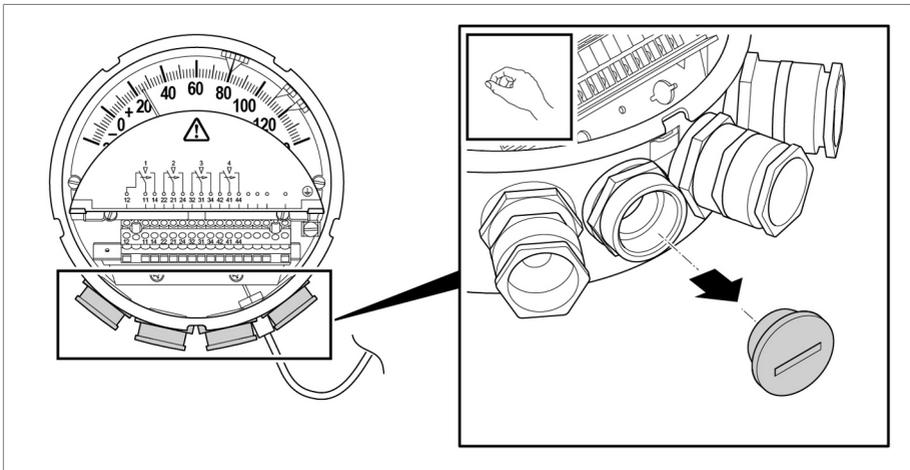


Figure 22: Removing the locking screw

5 Installation and commissioning

3. Unscrew the provided cable gland and remove the dust protection disk.

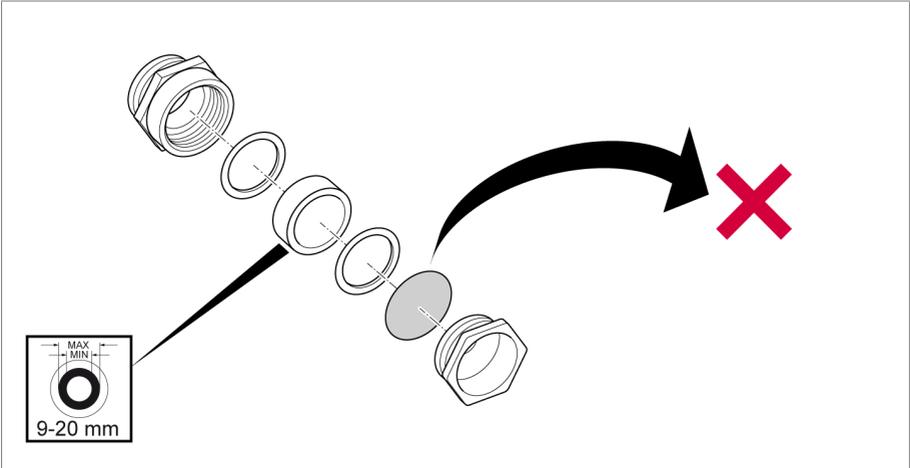


Figure 23: Removing the dust protection disk

4. Route a sufficient length of connection cable through the cable gland and adapter and tighten the cable gland (see Cable gland dimensions [► Section 10.4, Page 68]).

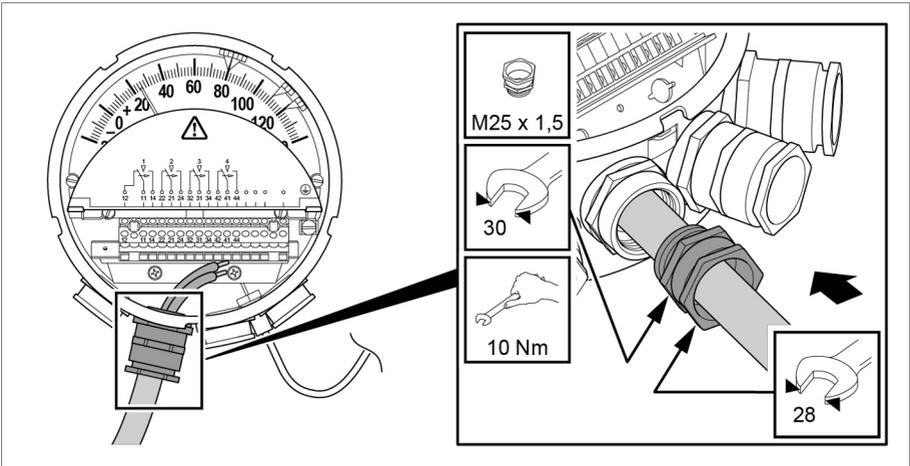


Figure 24: Cable gland

Also refer to

📄 Cable gland dimensions [► 68]

5 Installation and commissioning

5.4.4.2 WADI cable gland (stainless steel or brass)

1. **NOTICE!** If the cable gland is not used, equip it with a sealing plug or replace the entire cable gland with a dummy plug in order to ensure the IP degree of protection.
2. Remove the locking screw on the adapter.

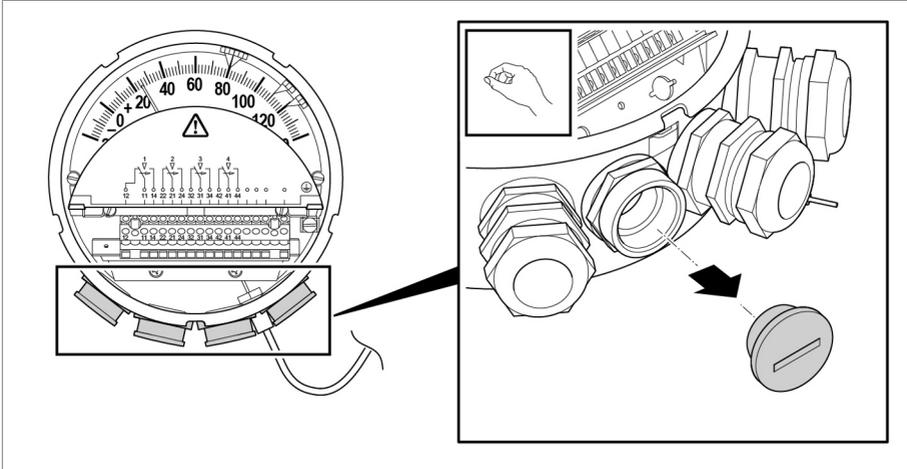


Figure 25: Removing the locking screw

3. Unscrew the provided cable gland and remove the dust protection disk.

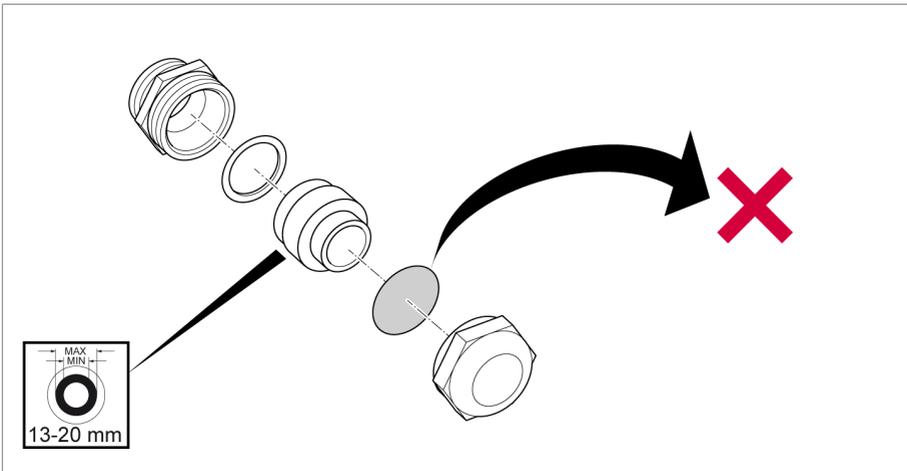


Figure 26: Removing the dust protection disk

5 Installation and commissioning

4. Route a sufficient length of connection cable through the cable gland and adapter and tighten the cable gland.

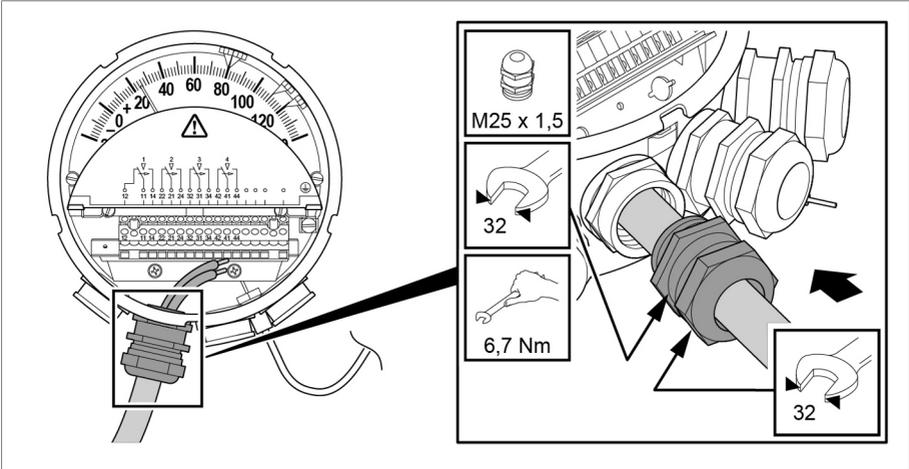


Figure 27: Cable gland

5.4.4.3 Offshore cable gland (stainless steel)

1. **NOTICE!** If the cable gland is not used, equip it with a sealing plug or replace the entire cable gland with a dummy plug in order to ensure the IP degree of protection.
2. Remove the locking screw on the adapter.

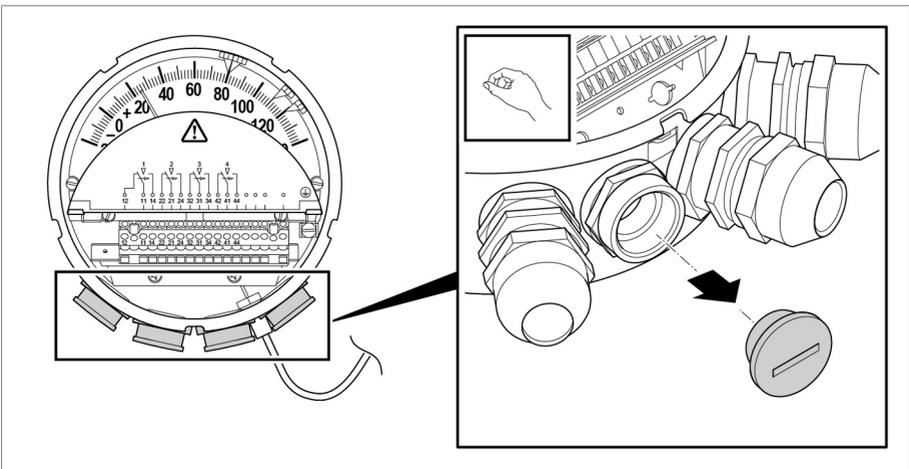


Figure 28: Removing the locking screw

5 Installation and commissioning

3. Unscrew the provided cable gland and remove the dust protection disk.

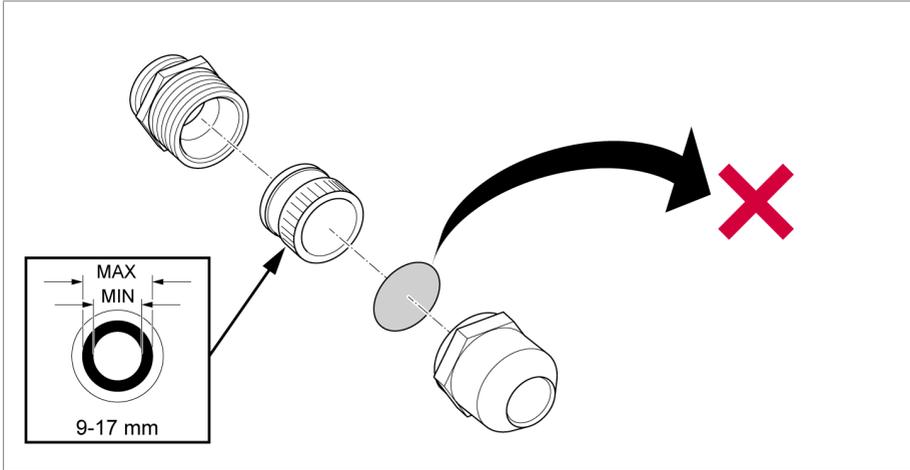


Figure 29: Removing the dust protection disk

4. Route a sufficient length of connection cable through the cable gland and adapter and tighten the cable gland.

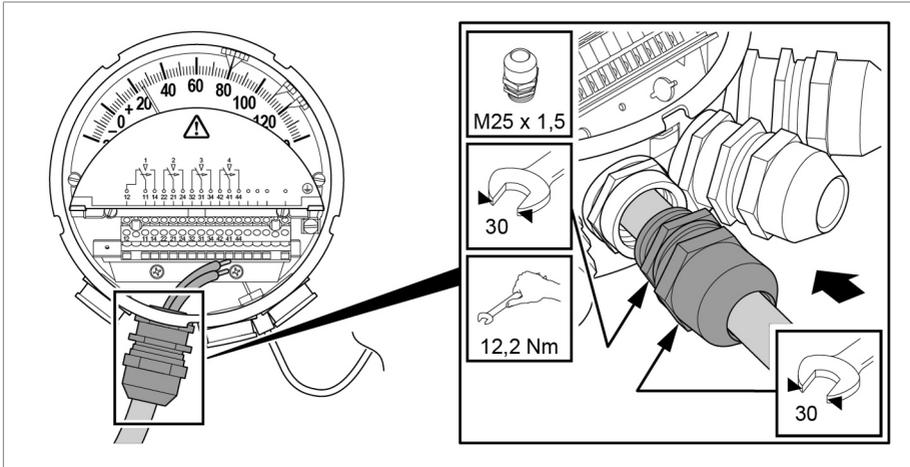


Figure 30: Cable gland

5.4.4.4 1/2" 14NPT adapter

1. **NOTICE!** If the adapter is not used, equip it with a sealing plug in order to ensure the IP degree of protection.

5 Installation and commissioning

2. Remove the locking cap.

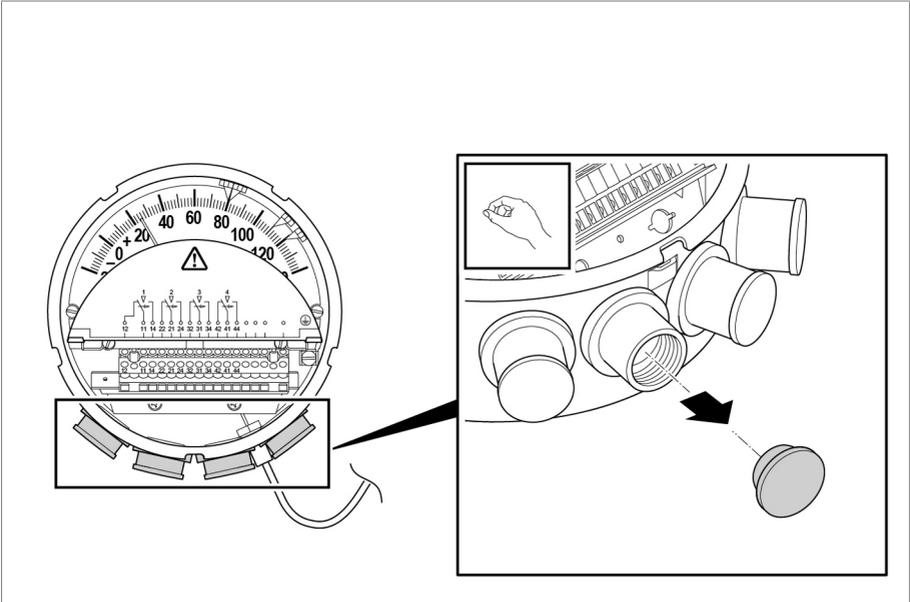


Figure 31: Removing the locking cap

3. Screw a cable conduit or cable tube with 1/2" 14NPT external thread into the adapter correctly and tightly. Feed through a sufficient length of cable.

5.4.4.5 3/4" 14NPT adapter

1. **NOTICE!** If the adapter is not used, equip it with a sealing plug in order to ensure the IP degree of protection.

5 Installation and commissioning

2. Remove the locking cap.

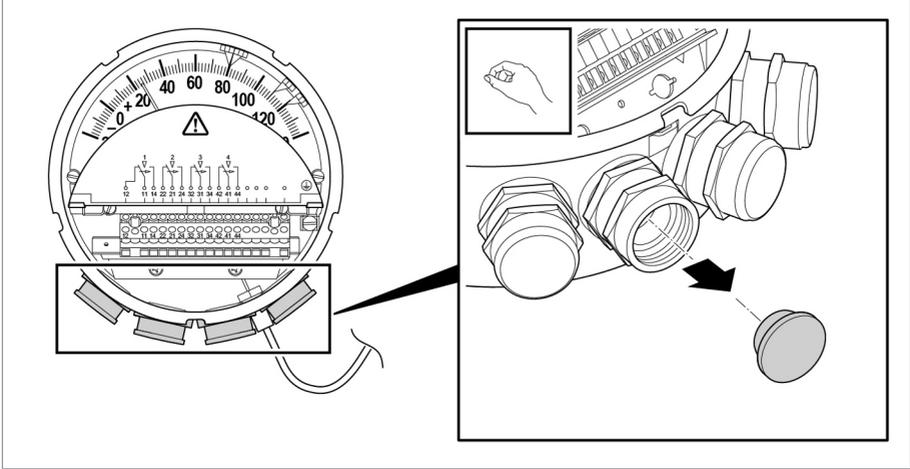


Figure 32: Removing the locking cap

3. Hold the adapter with an open-end wrench.

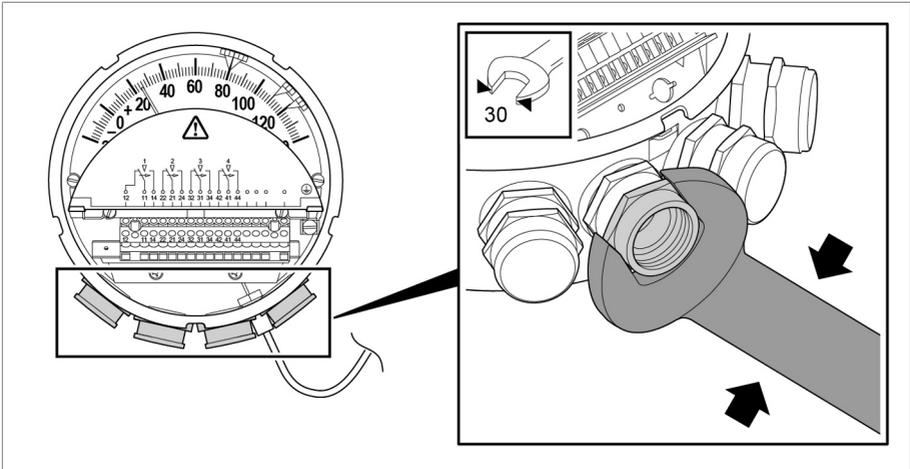


Figure 33: Holding the adapter

4. Screw a cable conduit or cable tube with 3/4" 14NPT external thread into the adapter correctly and tightly. Feed through a sufficient length of cable.

5 Installation and commissioning

5.4.5 Protective conductor connection

⚠ DANGER



Electric shock

Risk of fatal injury due to lack of protective conductor connection.

- ▶ Always connect the protective conductor connection before connecting any potentially dangerous circuits.

To connect the pointer thermometer with the protective conductor, proceed as follows:

- ▶ Equip the protective conductor (PE) with a forked cable shoe or ferrule and secure it to the protective conductor screw of the pointer thermometer.

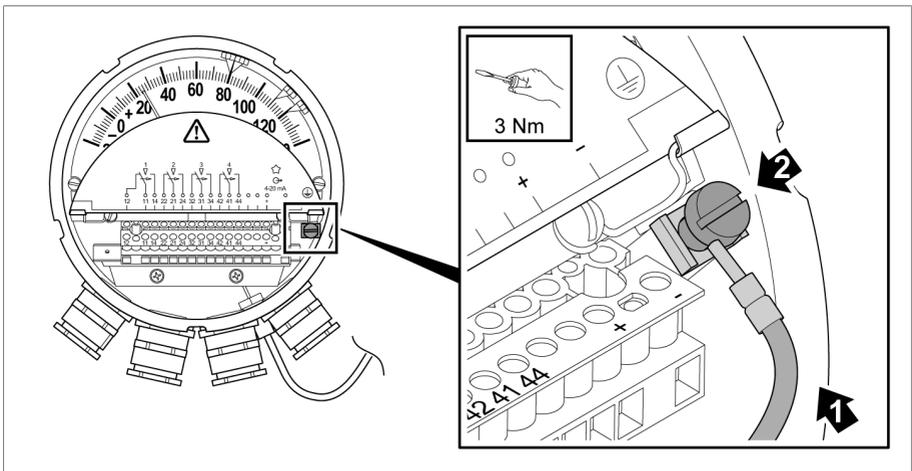


Figure 34: Connecting the protective conductor to the pointer thermometer

5.4.6 Connecting the micro-switches

⚠ WARNING



Electric shock!

When a dangerous electrical voltage is applied to one of these main switching contacts, the neighboring relay contacts must not be operated with protective extra-low voltage.

5 Installation and commissioning

To connect the micro-switches, proceed as follows:

- ▶ Connect the wires to the terminal strip in accordance with the connection diagram.

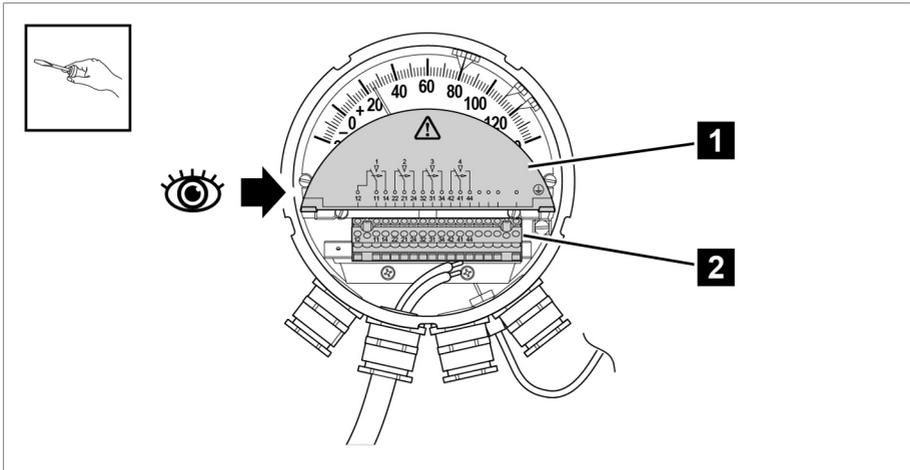


Figure 35: Connecting the micro-switches

1 Connection diagram

2 Terminal strip

5.4.7 Connecting cable glands/NPT adapters

NOTICE

Damage to the device!

If you do not use any locking screws, or if you use the wrong ones, the IP55 degree of protection cannot be guaranteed. Dirt or moisture can penetrate and cause damage to the device.

- ▶ Seal unneeded cable glands/NPT adapters with suitable locking screws and gaskets to ensure the IP55 degree of protection.

5.5 Checking micro-switches

NOTICE

Damage to the device!

If you move the micro-switches on the colored indicator points, they can bend or break.

- ▶ Only move micro-switches on the retaining bridges of the indicator points.

NOTICE

Damage to the device!

Turning the pointer counter-clockwise can damage the device.

- ▶ Only turn the pointer clockwise.

5.5.1 Micro-switch to the right of the pointer

If the micro-switch is to the right of the pointer, proceed as follows:

1. **NOTICE!** Damage to the device! If the pointer jumps back to the starting position, the micro-switches can be damaged. Turn the pointer clockwise past the micro-switches by hand and do not let go. Check the function here and, if necessary, connect a continuity tester to the terminal strip to do so.

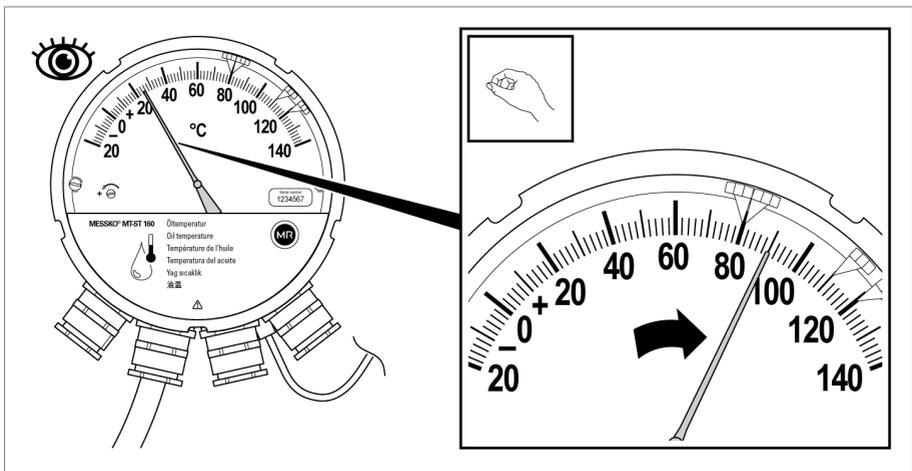


Figure 36: Moving the pointer past the micro-switches

5 Installation and commissioning

2. Slowly return the pointer to its starting position.

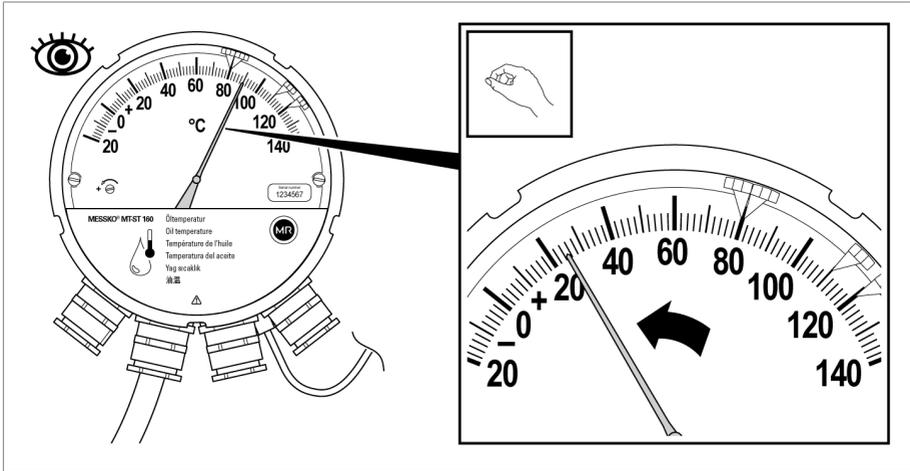


Figure 37: Returning the micro-switches

⇒ A return spring pulls the pointer back to its exact starting position.

5.5.2 Micro-switch to the left of the pointer

If the micro-switch is to the left of the pointer, proceed as follows:

1. Move the micro-switches clockwise past the pointer individually and in succession and check the function. If necessary, connect a continuity tester to the terminal strip to do so.

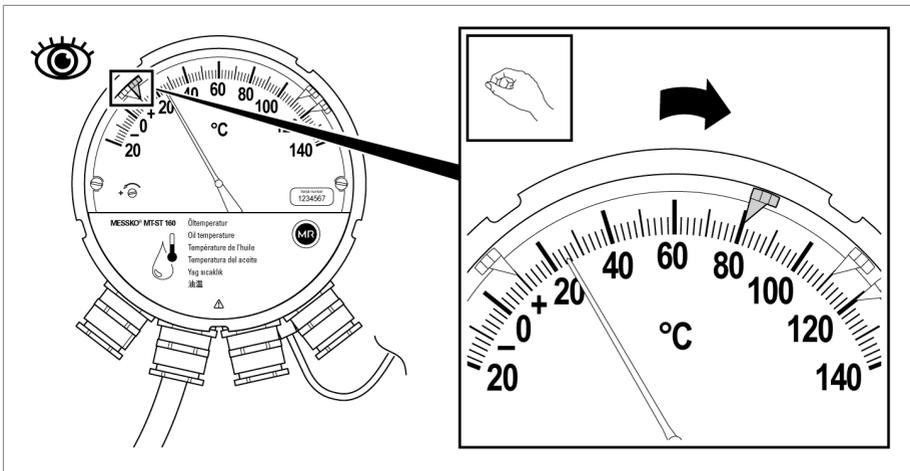


Figure 38: Moving the micro-switches past the pointer

5 Installation and commissioning

2. Set the micro-switches back to their original value.

5 Installation and commissioning

5.6 Closing the cover plate

- ▶ Close the cover plate.

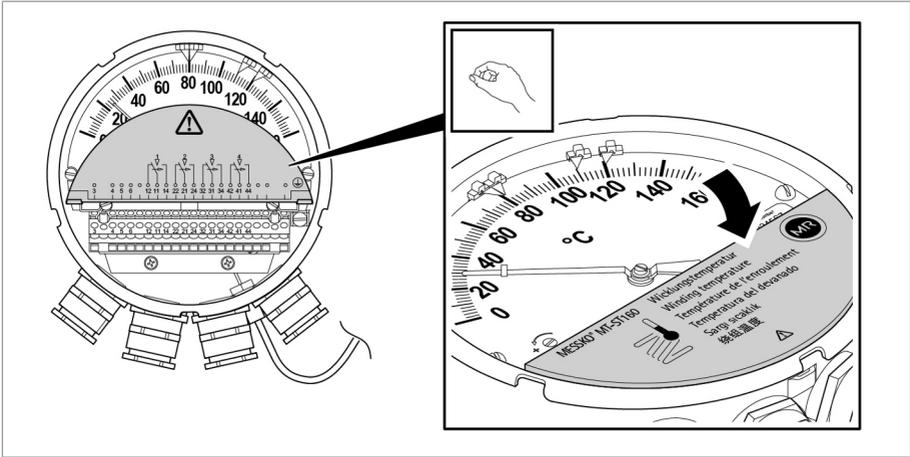


Figure 39: Closing the cover plate

5.7 Positioning the bayonet seal ring

- ✓ Ensure that the drag hand is positioned to the right of the pointer.

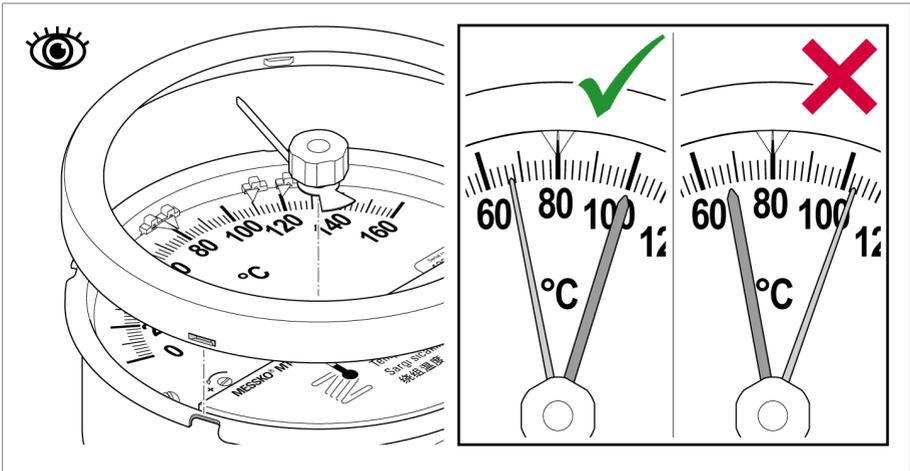


Figure 40: Position of the drag hand

5 Installation and commissioning

- Reposition the bayonet seal ring with viewing glass on the pointer thermometer, press down firmly and turn 30...40° clockwise so that the viewing glass is pressed firmly into the rubber gasket all the way around.

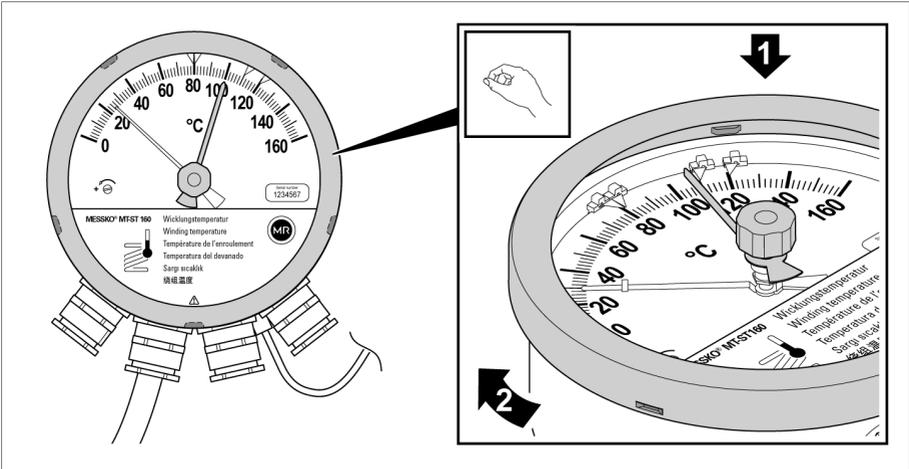


Figure 41: Positioning the bayonet seal ring

⇒ The pointer thermometer is ready for operation.

6 Operation

6.1 Resetting drag hands

The drag hand slides along with the pointer when measured temperature values increase and marks its maximum value. You can reset the drag hand as follows:

- ▶ Return the drag hand to the position of the thermometer pointer manually using the drag hand reset.
- ⇒ The drag hand and pointer are positioned one above the other.

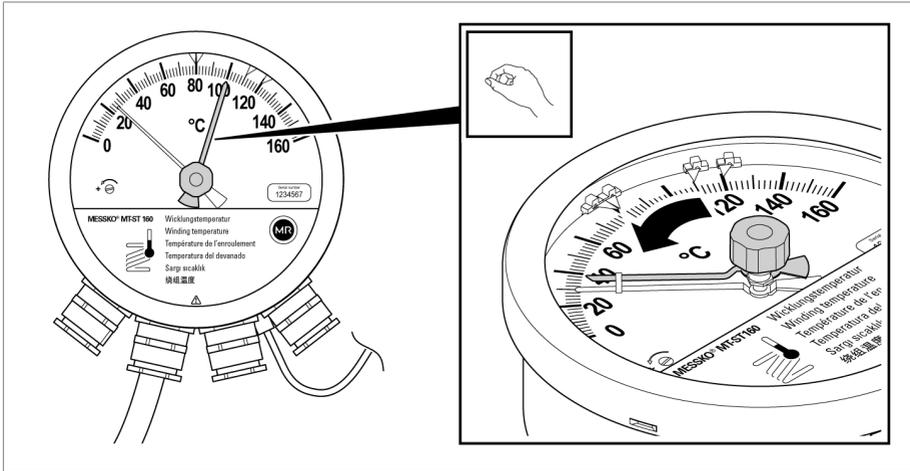


Figure 42: Resetting drag hands

7 Maintenance, inspection and care

Maintenance

The device is maintenance-free.

Inspection

Depending on the conditions of use of the device and the national regulations in the respective country of use, the transformer manufacturers can specify different inspection intervals.

- ▶ Observe the inspection intervals defined in CIGRE Publication No. 445 "Guide for Transformer Maintenance" or the inspection intervals specified by the transformer manufacturer.

During occasional visual inspections of the transformer, you can inspect and clean the device as follows:

1. Clean the housing of the device with a dry cloth.
2. Make sure that the ventilation is free of dirt and deposits.
3. Check the device for external damage and contamination.

In the event of questions or irregularities, contact the Technical Service department:

Maschinenfabrik Reinhausen GmbH

MR Service & Complaint

Falkensteinstrasse 8

93059 Regensburg, Germany

E-mail: service@reinhausen.com or complaint@reinhausen.com

8 Disposal

Observe the national disposal regulations in the country of use.

8.1 SVHC information in accordance with the REACH regulation

This product complies with the provisions of European Regulation 1907/2006/EC dated December 18, 2006 on the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH).

The following components of the product contain > 0.1% [w/w] of the SVHC substance lead (CAS no. 7439-92-1):

- Brass alloy
- Standard parts with a low property class

9.1 Technical data – oil temperature / winding temperature

MESSKO® MT-STW160F / MESSKO® MT-STW160F2 / TRASY2 series	
Operating/ambient conditions	
Location of use	Indoors and outdoors, tropic-proof
Operating temperature	-40...+80 °C
Storage temperature	-50...+80 °C
Ambient air temperature	-50...+80 °C
Insulating fluid temperature	Measuring range +/- 20%
Installation altitude	2,000 m above mean sea level
Degree of protection	IP55 in accordance with DIN EN 60529 VDE 0470-1
Protection class	1
Overvoltage category	III
Relative humidity	Viewing glass, fog-resistant up to 80% relative humidity due to ventilation device
Contamination level	2
General	
Housing (standard)	Sheet steel, galvanized, coated in RAL 7033 in accordance with DIN EN ISO 12944-9 corrosion protection class C4H
Offshore optional	As per the requirements in accordance with DIN EN ISO 12944-9 with corrosion-protection class CX
Housing color	RAL 7033 cement gray; RAL 7038 agate gray
Front ring and housing	Powder-coated, bayonet ring with silicone seal
Housing dimensions	Ø 173 mm [Ø 6.81"]; Depth 98 mm [3.86"]
Weight	Approx. 2.5 kg (6 m capillary line)
Housing color	RAL 7033 cement gray; RAL 7038 agate gray
Inspection window	Laminated safety glass with UV filter
Temperature sensor	Bare brass

9 Technical data

General	
Retaining plate	Stainless steel
Capillary line	Copper capillaries with PVC protective tube and optional add-on stainless steel protective tube
Capillary line length	2 m / 4 m / 6 m / ... / 20 m possible
Cable gland	4 x M25x1.5 nickel-plated brass
Drag hands	Drag hands that can be reset manually, red
MESSKO® MT-STW160F / MESSKO® MT-STW160F2 / TRASY2 series	
Measuring ranges	
Winding temperature measuring range*	0...+160 °C
Oil temperature measuring range*	-20...+140 °C
Tolerance	±3 °C in accordance with DIN EN 13190 Class 1 and DIN 16196
* Other measuring ranges on request	
Connection terminals	
Cross section	1.5...2.5 mm ² , 16...12 AWG (rigid or flexible)

Also refer to

 Technical data – accessories [▶ 63]

9.2 Micro-switches

Quantity	1...6 adjustable micro-switches
Minimum switching distance	6% of the measuring range for standard switch arrangement; <1 K for narrowing
Switching hysteresis	Approx. 5 K (for decreasing temperature)
Rated insulation voltage in accordance with IEC 60076-22-1	2,500 V AC/1 min; terminals to ground 1,000 V AC/1 min; between open terminals
Lightning impulse withstand voltage in accordance with IEC 60076-22-1	4,000 V; terminals to ground 3,000 V; between open contacts

9 Technical data

Contact material	Standard: silver alloy (AgNi10) Optional: gold-plated contacts
Contact type	Change-over contact, normally open contact
Switching capacity	230 V AC
Standard switch in accordance with IEC 60076-22-1	Making capacity: 250 VA, $\cos \varphi > 0.5$ Breaking capacity: 60 VA, $\cos \varphi > 0.5$
	24...220 V DC Making capacity: 130 W, $L/R < 40$ ms Breaking capacity: 25 W, $L/R < 40$ ms
Switching capacity, switch with gold-plated contacts*	230 V AC Switching capacity: Max. 6.9 VA, $\cos \varphi = 0.9$
*) Switching higher loads destroys the gold layer	24...220 V DC Switching capacity: Max. 6.6 W, $L/R > 25$ ms

Miniature circuit breaker

– Rated current	6 A
– Triggering characteristic	C

Micro-switch arrangement



Depending on your order, the micro-switch arrangements can deviate from the following versions.

9 Technical data

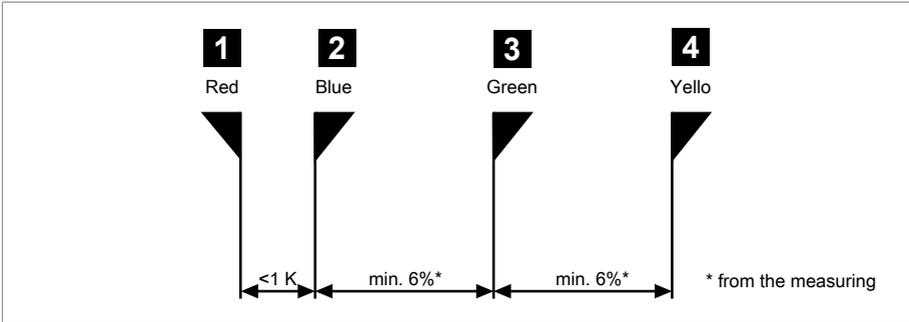


Figure 43: Switch arrangement 1+2

1 + 2

tight

$<1 K$

with standard model

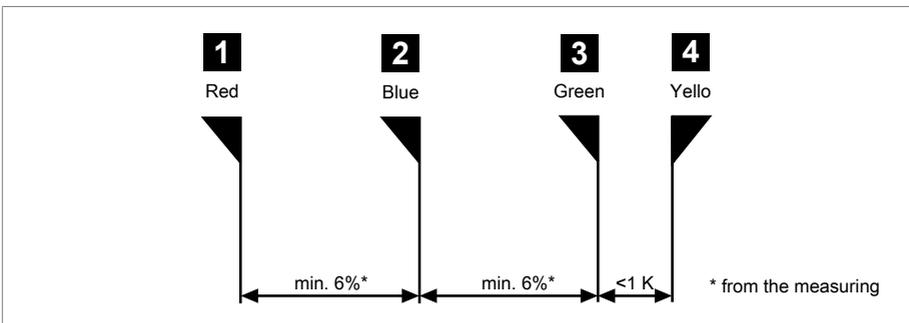


Figure 44: Switch arrangement 3+4

3 + 4

tight

$<1 K$

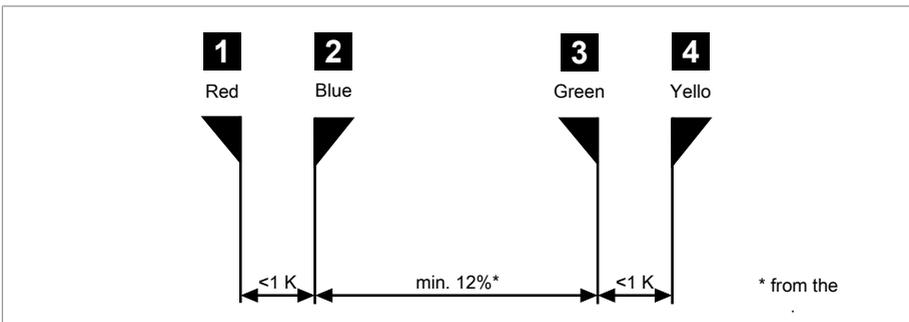


Figure 45: Switch arrangement 1+2 and 3+4

1 + 2 and 3 + 4

tight

$<1 K$

9.3 Technical data – accessories

Technical data	MESSKO® ZT-F2.1 temperature transmitter module
Function	Indirect measurement and simulation of the hotspot temperature in a transformer using the temperature gradient between the winding hotspot and coolant See Figure TRASY modules and operating instructions for the MESSKO® ZT-F2.1 transformer temperature transmitter product
Operating conditions and ambient conditions	
Ambient temperature	-50...+80 °C
Degree of protection	IP56 in accordance with EN 60529, with pressure equalization element
Rated insulation voltage	50 V DC; 300 V AC 1 min.; terminals to ground
Location of use	Indoors and outdoors, tropic-proof
Mounting position	Any
General	
Housing	Cast aluminum, RAL 7033 coated
Well and screw connection	Bare brass; G1"B \pm BSP1" double screw connection; others on request
Cable gland	2 x M25x1.5; 1 x M16x1.5; nickel-plated brass
Output signal	Pt100 measuring resistor in accordance with IEC 751 (100 Ω at 0 °C)
Measuring range	-50...+160 °C
Weight	Approx. 1.7 kg
Analog output (option)	
Output signal	4...20 mA
Supply voltage	DC: 12...30 V unregulated, max. 10% residual ripple, protected against polarity reversal
Measuring range	0...+160 °C standard
Max. load resistance	750 Ω at 24 V DC
Thermal map	
Heating	Integrated into the well

9 Technical data

Technical data	MESSKO® ZT-F2.1 temperature transmitter module
Gradient setting	Hotspot gradient via DIP switch in the housing Maximum: 50 K at 2 A CT nominal current
CT input	Nominal current 1.5...2.0 A from converter
Technical data	Thermo well module
Material	Bare brass
Screw connection	G1"B \triangle BSP1" male screw connection
Installation dimensions	See Figure 2 and Figure 5
Mounting position	Vertical
Weight	Approx. 0.25 kg
Technical data	Combi well module
	Figure 5 and operating instructions for the MESSKO® combi well product
Operating conditions and ambient conditions	
Ambient temperature	-50...+80 °C
Rated insulation voltage	500 V AC/1 min; terminals to ground
Setup	Indoors and outdoors, tropic-proof
Mounting position	Any
General	
Housing	Cast aluminum, RAL 7033 coated
Well and screw connection	Bare brass; G1"B \triangle BSP1" double screw connection
Cable gland	2 x M20x1.5; nickel-plated brass
Output signal	Pt100 measuring resistor, Class B in accordance with IEC 751 (100 Ω at 0 °C)
Measuring range	-50...+160 °C
Weight	Approx. 0.8 kg
Analog output (option)	
Output signal	4...20 mA

9 Technical data

Technical data	Combi well module
Supply voltage	DC: 12...30 V unregulated, max. 10% residual ripple, protected against polarity reversal
Measuring range	-20...+140 °C standard
Max. load resistance	750 Ω at 24 V DC
Technical data	MESSKO® SNT36 power supply module
	See the operating instructions for the MESSKO® SNT36 DC power supply product
Technical data	MESSKO® multi-ballast transformer module
	See the operating instructions for the MESSKO® multi-ballast transformer product
Assembly versions	With mounting plate
	On rails
	With housing (RAL 7033)
Technical data	MESSKO® TRASY2 / MESSKO® COMPACT assembly version
	For connection options, see Figure 8

10 Appendix

10.1 MESSKO® TRASY2 pointer thermometer dimensions

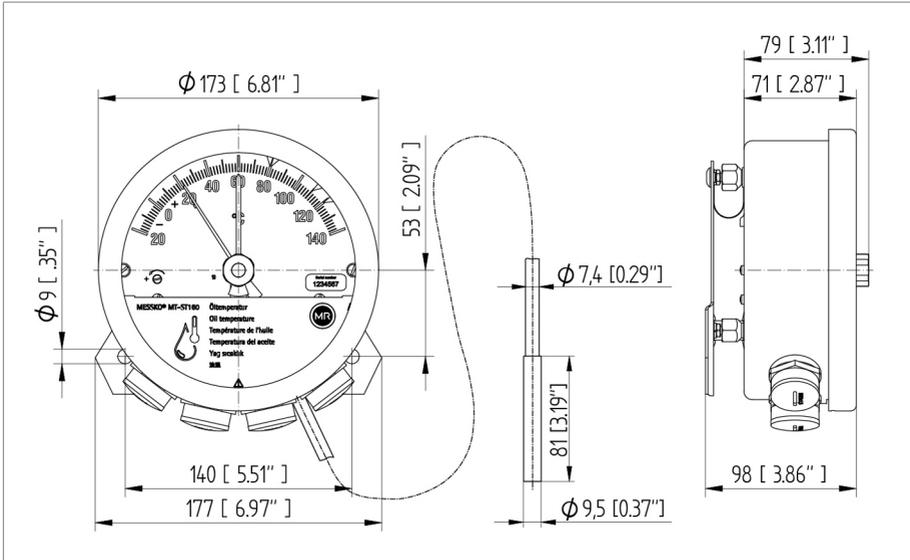


Figure 46: MESSKO® TRASY2

10.2 Step protection

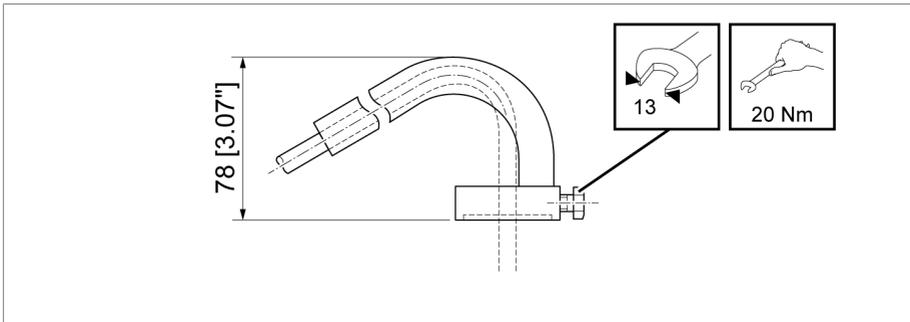


Figure 47: Step protection (only in combination with thermo well)

10.3 Vibration-damping plate/mounting plate

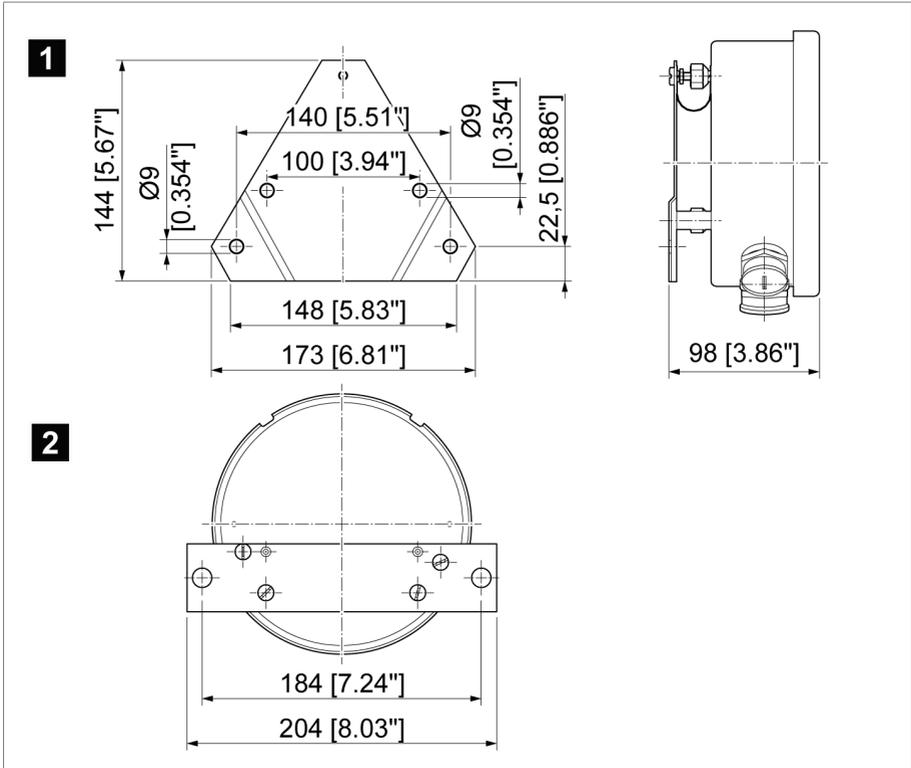


Figure 48: Dimensional drawing for vibration-damping plate and mounting plate

1 Vibration-damping plate

2 Mounting plate

10 Appendix

10.4 Cable gland dimensions

Standard cable gland

M25x1.5 nickel-plated brass

Clamping range 9...20 mm

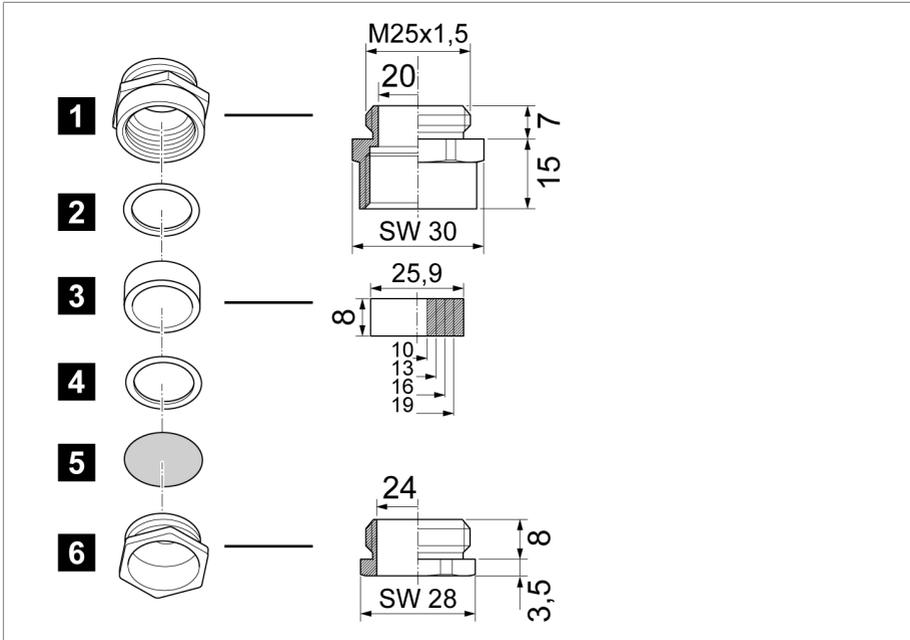


Figure 49: Standard cable gland

1 Gland base

2 Pressure ring

3 Universal sealing ring, NBR

4 Pressure ring

5 Dust protection disk

6 Pressure screw

WADI cable screw connection (water-tight; optional)

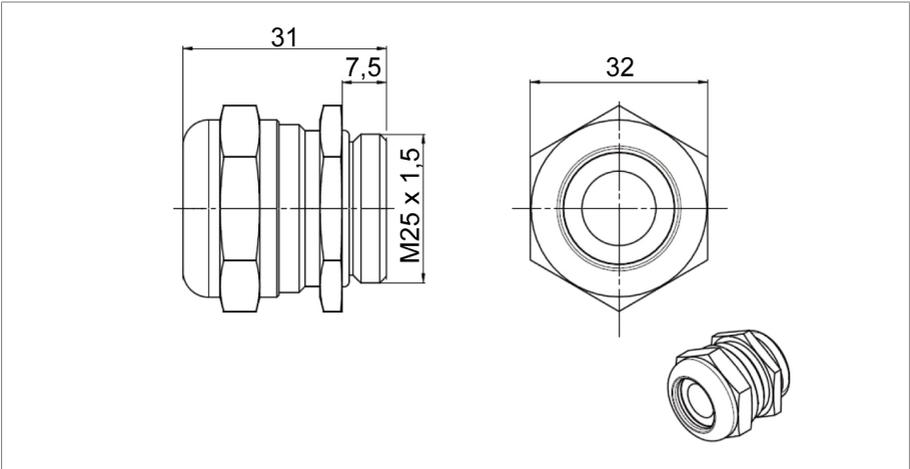


Figure 50: WADI cable screw connection; material: nickel-plated brass; clamping range 13...20 mm

Offshore cable screw connection (optional)

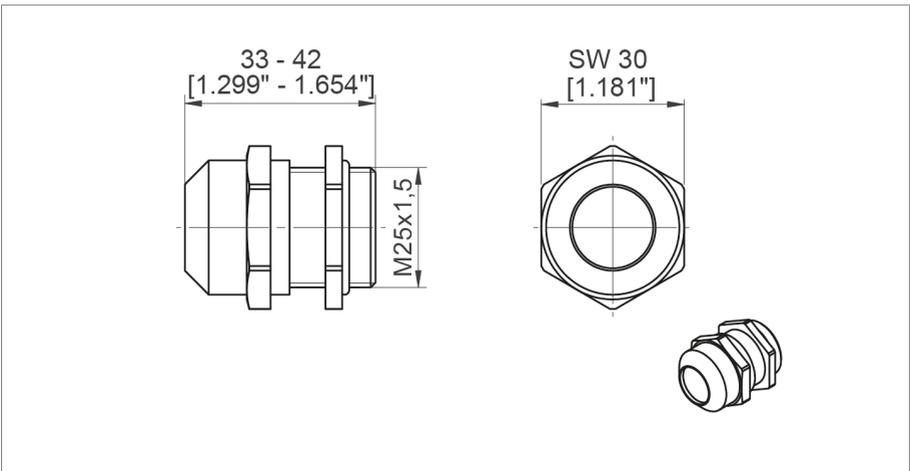


Figure 51: Offshore cable screw connection; material: stainless steel (V4A); clamping range 9...17 mm

10 Appendix

NPT adapters (optional)

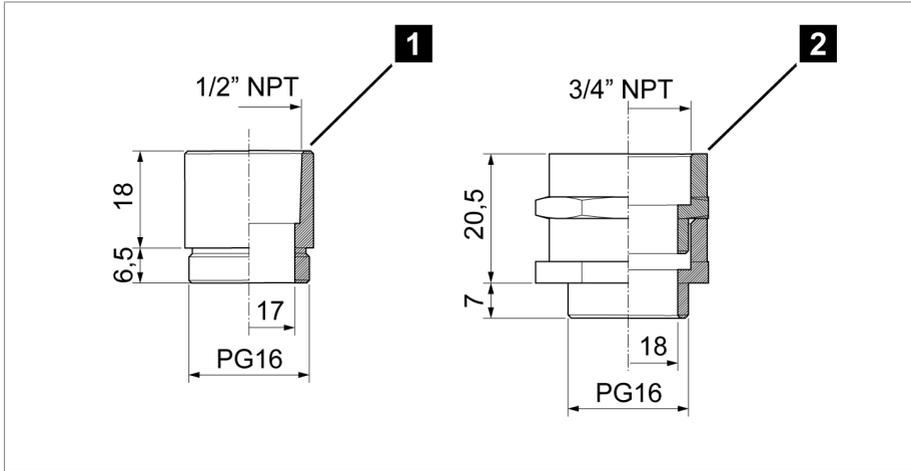


Figure 52: NPT adapters

1 1/2" NPT

2 3/4" NPT

10.5 TRASY2 series installation

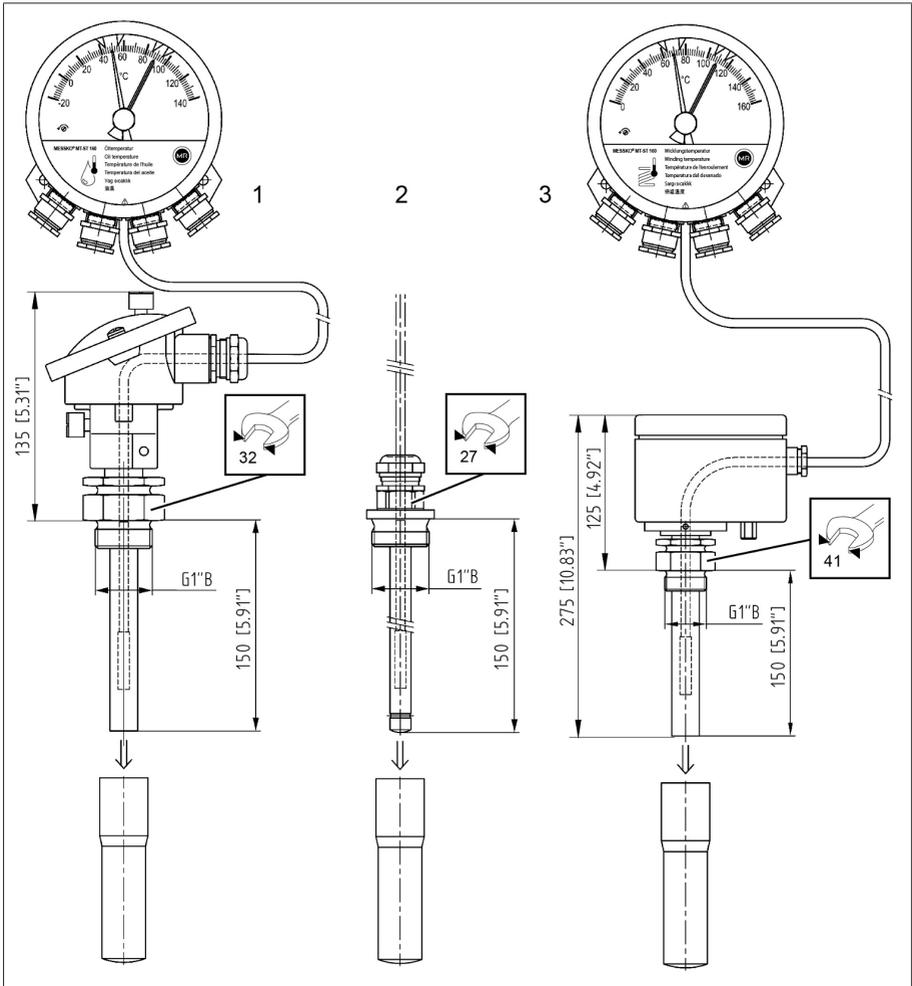


Figure 53: TRASY2 installation modules

1 Combi well for Pt100 (RTD) or 4...20 mA, -20...+140°C

2 G1\"/>

10 Appendix

3 MESSKO® ZT-F2.1

with 1 or 2 x Pt100

1 or 2 x 4...20 mA, 0...+160°C

1 x Pt100, 1 x 4...20 mA, 0...+160°C

1 x Pt100, 1 x 4...20 mA, -20...+140°C

Ambient air temperature

Permissible temperature of the air in the surroundings of the equipment in operation on which the device is installed.

EMC

Electromagnetic compatibility

Insulating fluid temperature

Permissible temperature of the insulating fluid in the product or directly on the product.

Operating temperature

Permissible temperature in the immediate surroundings of the device during operation taking ambient influences, for example due to the equipment and installation location, into consideration.

SCADA

Technical processes are monitored and controlled using a computer system (Supervisory Control and Data Acquisition)

Storage temperature

Permissible temperature for storing the device in an unmounted state or in a mounted state so long as the device is not in operation.

Maschinenfabrik Reinhausen GmbH

Falkensteinstrasse 8
93059 Regensburg

☎ +49 (0)941 4090-0

✉ sales@reinhausen.com

www.reinhausen.com

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